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Draft Environmental Impact Statement Vail Ski Area Category III Development

Eagle County, Colorado

November 1995

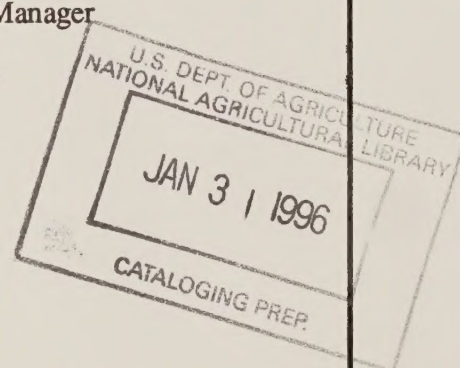
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Abstract: The Draft Environmental Impact Statement (Draft EIS) provides analysis of four alternatives considered for the potential development of the Category III area of Vail Ski Area near Vail, Colorado. Vail Associates, Inc. (VA) operates the ski area under terms of a 40-year term Special Use Permit which was issued by the USDA-Forest Service (Forest Service) in 1992. The Draft EIS has been prepared pursuant to Section 102(2)(C) of the National Environmental Policy Act (NEPA) (1969, as amended). The Forest Service is the lead agency for consideration of this proposal, and the Army Corps of Engineers (ACOE) is participating as a cooperating agency. Several other agencies and offices from various levels of government have also had input into the preparation of this document. The four alternatives were evaluated in terms of direct, indirect, and cumulative impacts on natural and human resources, and included: **A) No Action; B) Center Ridge -less development than the Proposed Action; C) VA's Proposed Action; and D) Master Development Plan - conceptual plan from the 1986 Master Development Plan.** The agency-preferred alternative is Alternative C. This document meets NEPA requirements to analyze and disclose potential physical, biological, and human effects related to the proposed development. It also contributes to the analysis and regulatory process required to meet provisions of the Clean Water Act (1977, as amended) and other federal mandates.

Reviewers should provide the Forest Service with their comments during the review period of the Draft Environmental Impact Statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the NEPA process so that it is meaningful and alerts the agency to the reviewers' position and contentions. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the Final Environmental Impact Statement. City of Angoon v. Hodel (9th Circuit, 1986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the Draft Environmental Impact Statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Comments must be received by December 26, 1995

18/10/19

Acronyms

Reader's Guide

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1.0 Purpose and Need

LIST OF ACRONYMS AND ABBREVIATIONS

ACOE	Army Corps of Engineers
AC	Aspen/conifer mixed forest
AL	Alpine tundra
AS	Aspen forest
AUM	Animal unit month
BA	Biological Assessment
BE	Biological Evaluation
BLM	Bureau of Land Management
BMP	Best Management Practices
BO	Biological Opinion
CAT I, II, III	Category One, Two, Three
CDA	Connected Disturbed Area
CDH	Colorado Department of Health
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	Cubic feet per second
DF	Douglas fir
DMA	Debris flow-mudflow deposition area
DSA	Debris slide and debris avalanche prone areas
DN	Decision Notice
DOA	Department of the Army
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FONSI	Finding of No Significant Impact
FS	Forest Service (a federal agency)
FSM	Forest Service Manual
FWS	Fish and Wildlife Service (a federal agency)
GM	Grassland meadow
GMU	Game management unit
GO	Gambel oak
HABCAP	Habitat Capability Program
HSI	Habitat Suitability Index
HU	Habitat Units
LA	Landscape Area
LOS	Level of Service
LP	Lodgepole forest
LS	Lodgepole savannah
MB	Mountain brush
mmbf	million board-feet
MDP	Master Development Plan
MF	Mixed lodgepole pine/spruce-fir forest
MIS	Management Indicator Species

MS	Mixed savannah
NAAQS	National Ambient Air Quality Standards
NBS	National Biological Survey
NCH	Non-channelized hillslopes
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
NWPS	National Wilderness Preservation System
PA	Project Area
PCDA	Potential connected disturbed areas
PL	Public Law
PM ₁₀	Particulate matter under 10 microns
POTL	Products other than logs
PSD	Prevention of Significant Deterioration
PUS	Potentially unstable slopes
R2	U.S. Forest Service Region 2 (Rocky Mountain Region)
RA	Regional Area
RARE II	Roadless Area Review and Evaluation
RF	Rockfall area
RMRIS	Rocky Mountain Resource Information System
RNA	Research Natural Area
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
RS	Rock scree
SAOT	Skiers at one time
SAS	Special Aquatic Sites
SASEM	Simple Approach Smoke Estimation Model
SF	Spruce-fir
SFE	Single family equivalent
SS	Spruce-fir savannah
SUP	Special use permit
SWE	Snow water equivalent
TOV	Town of Vail
TSP	Total suspended particles
U	Urban land
UERWA	Upper Eagle River Water Authority
UEVCSD	Upper Eagle Valley Consolidated Sanitation District
US	Unstable slope
U.S.C.	United States Code
USDA-SCS	U.S. Department of Agriculture - Soil Conservation Service
VA	Vail Associates, Inc. (the proponent)
VAC	Visual Absorption Capacity
VMS	Visual Resources Management System
VQO	Visual Quality Objectives
VVCWD	Vail Valley Consolidated Water District
WM	Wet meadow
WR	Willow riparian
WRNF	White River National Forest

**2.0 Proposed Action
and Alternatives**

Reader's Guide

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1.0 Purpose and Need

READER'S GUIDE AND DOCUMENT ORGANIZATION

STRUCTURE OF THE DOCUMENT

Understanding the structure of this document is crucial to an overall understanding of the information and process required in an EIS. This guide should quickly help you familiarize yourself with this document prior to reading it in detail. First, you'll notice that this Draft EIS has been assembled in a 3-ring binder. This was done to optimize its usefulness as a working document and allow you to conveniently remove and use maps and other components. The last section in the document is labeled "MAPS". This section contains 11x17-inch colored, fold-out maps. Their purpose is to enhance your overall understanding of the relative location of resources, proposed development, or features being discussed at a reasonable land scale. Figures are different from maps in that they are smaller, black and white, and are found soon after they are first mentioned in text. Tables are also found within the text immediately after their first mention. A brief description of each component in the order of their appearance in this document follows.

Acronyms - A list of acronyms and abbreviations important to understanding this document precedes this guide.

Table of Contents - The Table of Contents reflects the structure of the entire document including a list of all figures, tables, and appendices. The Table of Contents only lists four levels of organization. Each chapter has its own Table of Contents.

Summary - The short Summary found with this EIS provides a concise overview and references figures, tables, and maps found in the body of the document. A much longer Summary was also produced for those who did not wish to have a copy of the full EIS. This longer summary is not part of this EIS, but is derived from it.

Chapter 1- Purpose and Need - This chapter describes the purpose and need for the proposal and its scope of analysis. It briefly defines the NEPA process, describes the project area and background, and establishes agency involvement and decisions to be made. The final sections describe scoping and other public involvement activities and lists approvals and permits that may be required.

Chapter 2 - The Proposed Action and Alternatives - This chapter includes a description of the action proposed by Vail Associates, Inc. and a full range of alternatives to it, including the option to take "No Action". The environmental impacts of the various alternatives are summarized and compared in terms of their possible effects on various resources. Both

standard and potential project-specific mitigation measures are listed, and their potentially efficacy assessed.

Chapter 3 - The Affected Environment - This chapter describes current physical, biological, social, and economic conditions within the proposal's area of influence. This information provides the baseline for assessment and comparison of the potential impacts of the Proposed Action and the alternatives to it.

Chapter 4 - Environmental Consequences - Using the baseline established in Chapter 3, this chapter details the possible direct, indirect, and cumulative effects of the Proposed Action and each alternative. Unavoidable adverse impacts and irreversible and irretrievable commitments of resources are also discussed along with potential mitigation measures. This chapter constitutes the comprehensive scientific and analytic comparison of the potential environmental impacts for the Proposed Action and each alternative.

Chapter 5 - List of Preparers - A summary of the qualifications and responsibilities of specialists with direct input into the preparation of this Draft EIS.

Chapter 6 - Coordination, Consultation, and Distribution - Two lists: the first of the meetings with agencies, organizations, and persons who have provided input to this EIS; the second list contains the names of the agencies, organizations, and individuals who were provided copies of the Draft EIS or the summary of the document noted above.

Chapter 7 - References - An index of sources of informational material and data used in the description and analysis in this EIS.

Glossary - Definitions of key words that are used in this EIS.

Index - A list of many key words used in the document and the pages where they occur.

Appendices - Several appendices are included in this EIS. They contain information that is important to understanding the analysis but that was too long to include in text. For example, a copy of the proposal from Vail Associates is part of Appendix A.

MAPs - 11X17 inch tip-out, colored maps for certain resources.

2.0 Proposed Action
and Alternatives

Summary

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1.0 Purpose and Need

INTRODUCTION

This summary presents an overview of the Draft Environmental Impact Statement (Draft EIS) prepared in response to a proposal (Proposed Action) from Vail Associates, Inc. (VA). It is divided into two sections. Section I discusses the Purpose and Need for the Proposed Action, describes the decisions to be made by the Forest Service, and summarizes issues identified during scoping. Section II explains the Proposed Action and alternatives to it, compares the alternatives, and identifies the Forest Service's Preferred Alternative. These sections generally correspond to Chapters 1 and 2 in the Draft EIS document itself. Chapter 3 Affected Environment, and Chapter 4 Environmental Consequences, are not summarized here. Reading this brief overview and the Readers Guide prior to reviewing the Draft EIS document, will facilitate understanding of the document and the EIS process to date.

VA proposes to develop a portion of the Category III area (CAT III) of the Vail Ski Area on the White River National Forest (WRNF) about 90 miles west of Denver in Eagle County, Colorado. The 4,100-acre CAT III area, an undeveloped portion of the Special Use Permit (SUP) area, was identified in the Vail Ski Area Master Development Plan (MDP) that was accepted by the Forest Service after preparation of an Environmental Assessment (EA) and Decision Notice (DN) in 1986.

The DN withheld approval of development of the CAT III area pending a site-specific proposal and environmental analysis under provisions of the National Environmental Policy Act of 1969, as amended (NEPA). The Proposed Action is VA's detailed proposal for development of a portion of the CAT III area and would add approximately 1,000 acres of mostly intermediate level, lift-accessed ski terrain to the Vail Ski Area. Primary elements include the construction of four ski lifts, a skiway/road system, ski trails, a restaurant, two warming shelters and food service facilities, utilities, ski patrol facilities, and three bridges spanning Two Elk Creek. No additional snowmaking, water withdrawals or summer recreation programs are part of this proposal.

As a summary, this document provides only important sections of the analyses contained in the full document. It describes the range of alternatives and some of the primary differences between the impacts that would occur under each alternative. Readers desiring a more comprehensive understanding of the full Draft EIS and analysis are encouraged to visit area libraries, the Holy Cross Ranger District Office in Minturn, or the WRNF office in Glenwood Springs, Colorado, where copies are on file for public review.

The Draft EIS is not a decision document. Its basic purpose is to disclose the environmental consequences that could occur through implementation of the alternatives under consideration. Under the NEPA process, this encompasses both public disclosure and sufficient analysis for the Forest Service decision. Comments from the public and other agencies will be solicited for a period of 45 days following publication of the availability of the Draft EIS in the *Federal Register*. Comments received will be evaluated and responses prepared during the preparation of the Final EIS. A Record of Decision (ROD) will be issued by the Forest Supervisor of the WRNF along with, or subsequent to, release of the Final EIS. The ROD will approve, disapprove, or modify proposed site-specific development within the SUP area.

SECTION I: PURPOSE AND NEED

Purpose of the Proposed Action

Introduction

The objectives of the Proposed Action are outlined in VA's proposal letter submitted to the Forest Service in February 1994. Prior to accepting the proposal and agreeing to move forward with it into a NEPA analysis, it was reviewed by the Forest Service using available information. Based on this review, it was determined that:

- 1) the proposal is consistent with the land allocation decision in the WRNF Land and Resource Management Plan (Forest Plan);
- 2) there are no apparent significant new circumstances or changed conditions that indicate that the Forest Plan allocation for the CAT III area should be changed;
- 3) the proposal includes reasonable efforts to minimize resource impacts; and
- 4) if approved and constructed, the CAT III area would function as an effective addition to Vail Ski Area.

Purpose

The objectives (purposes) of the Proposed Action as detailed in VA's proposal to the Forest Service are explained below, roughly in order of importance.

The first objective is to enhance the quality of skiing opportunities within VA's existing SUP area by:

- 1) offering more reliable and consistent skiing conditions, especially during early and late seasons, without creating additional snowmaking demands;
- 2) improving skier distribution throughout the entire ski area;
- 3) providing additional intermediate ski terrain;
- 4) improving skier distribution and utilization of China, Tea Cup, and Sun Up bowls and by providing a more direct end-of-day egress route from China and Tea Cup bowls and the CAT III area to Vail Village and the Lionshead base areas; and
- 5) providing backup lift service for Tea Cup, China, Mongolia, and Siberia bowls and the CAT III area, to and from, the front side of Vail Ski Area.

There are approximately 4,014 skiable acres within the developed portion of the Vail Ski Area. Approximately two-thirds of Vail's existing skiable terrain is located in the south-facing Back Bowls which, particularly during early and late season are vulnerable to closure during periods of poor snow or visibility conditions. When this occurs, skier densities increase on the front side of the ski area, and the quality of the experience is reduced. This

problem can be especially acute if the Back Bowls are not available during the Christmas to New Year's peak period or other high use periods. High elevation, north-facing slopes are the only practical remedies to address these reliability and consistency concerns. The undeveloped front side terrain with those characteristics is limited.

Intermediate skiers are a major component of ski area visitors. In the 1994-95 season intermediate skiers comprised 50 percent of all skiers at the Vail Ski Area, while only about 36 percent of Vail's ski terrain and 39 percent of its trail capacity is intermediate.

Currently, Lift 21 provides the only means of skier evacuation from Tea Cup, China, Mongolia, and Siberia bowls. These areas constitute approximately 1,612 acres of skiable terrain. Installation of the Tea Cup lift in this area would not only better distribute skiers, it would assure that skiers could be safely evacuated by lift if one of the other lifts were out of service. As proposed, the Tea Cup Lift could be approved as a stand-alone facility based on the analysis in the EIS.

The second objective is to make more efficient use of existing Town of Vail (TOV) and on-mountain infrastructure during traditionally low periods of use.

The third objective is to support community and ski area efforts to stabilize seasonal economic fluctuations and build annual skier visitation.

The Vail Ski Area's current manage-to capacity of 19,900 skiers-at-one-time (SAOT) is roughly in balance with the capability of the TOV's parking, road and mass transit systems, and the community's lodging, restaurant, and service sectors. Peak days occur when skier visitation exceeds about 18,000 SAOT. The Proposed Action is intended to increase skier visitation during non-peak periods and annually. In an informational brochure released prior to and during formal scoping activities VA indicated that, "The Category III project is not expected to increase the number or size of peak days ... the number of skiers during peak periods will continue to be constrained by access to the main mountain. This, in turn, is limited by initial lift service, parking, and the local transportation system."

The Proposed Action could also increase the number of high use days, defined as 15,000 to 18,000 skiers. The infrastructure of the ski mountain and the TOV can normally handle this level of activity, but it is a "busy" day. However, on-mountain services can become taxed during high use days if factors such as bad weather or poor snow conditions, which limit use of the Back Bowls, occur at the same time.

Opportunity exists to build skier visitation during traditionally low periods of use. Over the past several years, VA has demonstrated progress in this area and has been able to build season-long visitation while reducing the number of days over 15,000 SAOT.

Peak day demands on the TOV infrastructure were an important focus in the analysis for the 1986 EA and were critical in arriving at the 19,900 manage-to capacity. A series of mitigation measures outlined in the EA have since been implemented by VA, the TOV, and others. These measures, together with further cooperation between the TOV and VA has culminated in a formal agreement to work together to better manage the demands of peak days, make more efficient use of existing infrastructure, better balance visitation throughout the ski season, and maintain a high quality experience for Vail visitors during peak periods. Referred to hereafter as the Agreement, this document is officially titled the *Program to Manage Peak Periods*. The CAT III project is identified as an essential component of the implementation of the Agreement that could effectively assist in building off-peak skier visitation. As well, the Agreement notes that "... the TOV believes that the scope of the Forest Service's

environmental review need not focus on off-site issues related to the TOV since they have been previously identified, studied, and discussed through the public process, and since this Agreement will ensure growth management processes established herein are followed.”

Need

VA seeks to develop the CAT III portion of the SUP area and thus expand winter recreation in an area that, under the WRNF 1984 Forest Plan, is already allocated to a 1B Management Area Prescription which emphasizes downhill skiing. The EIS is tiered to the Forest Plan EIS. *The Rocky Mountain Regional Guide* (1992) places the CAT III area in the highest priority class for studying the addition of downhill skiing capacity.

VA’s proposal was accepted and adopted by the Forest Service as the Proposed Action, and the EIS process to evaluate the Proposed Action and alternatives to it was initiated. The Proposed Action is needed:

- 1) to respond to a proposal which has the potential for offering more effective recreation utilization of public lands without creating additional demands and impacts on off-site lands and communities;
- 2) to help to achieve Forest Service goals by providing high quality recreation experiences for visitors to the National Forest, specifically within the Vail Ski Area SUP area; and
- 3) to fulfill the broad management goals of the WRNF Forest Plan.

Decisions to be Made

The EIS is prepared on the premise that certain decisions must be made and that they will be documented in a ROD. Accordingly, it focuses on providing the analysis sufficient to make the following federal decisions:

- 1) Whether and under what conditions the Forest Service will approve the CAT III area and Tea Cup Bowl development plan submitted by VA or an alternative to it;
- 2) If the ski development is approved, to what extent the Forest Service will require that timber cleared for trails and other facilities be utilized and by what route it will be removed from the CAT III area; and
- 3) Whether and under what conditions to permit those activities affecting wetlands and waters of the United States, under Section 404 of the Clean Water Act. This is a decision of the U.S. Army Corps of Engineers (ACOE), a Cooperating Agency for the EIS.

Also based on the disclosure contained in the EIS, Forest Plan management requirements, standards and guidelines, or management area prescriptions could be amended for the Vail Ski Area including: 1) modifications to the SUP boundary, 2) changes to the current 1B downhill skiing management allocation of the CAT III area, and 3) other amendments to the Forest Plan. Any amendment to the Forest Plan would be specified in the ROD.

The decisions to be made and the analysis in the EIS are based on the assumption that the currently approved manage-to 19,900 SAOT capacity will not be exceeded. The provisions of the Agreement, current limits on local

infrastructure, and Forest Service SUP authorities indicate that this is a reasonable assumption. Any future request to increase the approved SAOT capacity would be subject to provisions of the SUP and would require analysis and disclosure under NEPA for both National Forest and off-site impacts that could result.

The type and intensity of data collected for the EIS and the requirements for its analysis are other aspects of the scope of the analysis. For instance, "NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail" (40 CFR 1500.1[c]).

The EIS documents only the environmental analysis of actions and activities being considered for the CAT III area and Tea Cup Bowl. Certain developments proposed in the 1985 MDP and approved in the 1986 EA and DN have not been completed. The EIS does not revisit those previous decisions. It will, to the extent appropriate for each resource or discipline, consider the combined (cumulative) effects of the CAT III area development and these previous projects. Before implementation of these projects is allowed, they are subject to Forest Service requirements for consideration of new information and appropriate environmental analysis. These previously approved developments are part of the continuation of the status quo as described in the No Action Alternative in Section II.

A ROD will be issued by the WRNF Forest Supervisor along with or subsequent to release of the Final EIS. The ROD will approve, deny, or approve in modified form, the site-specific development activities evaluated in the EIS. The ROD would authorize only those actions occurring on public lands administered by the Forest Service. However, mitigation measures may be identified that could be applied or required by other federal agencies as well as state or local governments. In the ROD, the decision maker may combine elements of several alternatives as long as the environmental effects have been sufficiently disclosed in the EIS. For instance, the impacts associated with the Tea Cup Bowl facilities are included as discrete elements of several other alternatives such that it also could be approved as a stand-alone development.

Besides the ROD from the Forest Service and the 404 Permit from the ACOE, the USDI-Fish and Wildlife Service (FWS) has received a draft Biological Assessment (BA) from the Forest Service, and will subsequently issue a Biological Opinion (BO) on the possible affects of the Proposed Action on threatened and endangered species as required by the Endangered Species Act (1973, as amended). Additionally, as required by Section 106 of the National Historic Preservation Act, a consultation with the Advisory Council on Historic Preservation, and the State Historic Preservation Officer has occurred. The results are summarized in the Cultural Resources portion of Section III.

There are many federal, state, and county laws and regulations which affect development and operation of the Vail Ski Area. VA is required by its SUP to comply with all applicable present and future state and local laws, ordinances and regulations to the extent that they do not conflict with federal law or policy. The Forest Service assumes no responsibility for enforcement of activities which are under these jurisdictions. Nor is the Forest Service bound by the actions of these entities in reviewing or approving proposed development on National Forest System (NFS) lands.

Scoping And Issues

NEPA requires that the public and other agencies be involved in the agency decision-making process. An important part of this process is scoping. CEQ regulations refer to scoping as a process to determine the "scope

of the issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7).

Since receiving VA's proposal, the Forest Service has: 1) published Notice of Intent to prepare an EIS in the *Federal Register* on March 17, 1994; 2) circulated a Scoping Summary to approximately 300 individuals, organizations, and agencies; 3) held public meetings in three towns and attended meetings in several others; 4) distributed about 520 Forest Service newsletters on April 6, 1995; 5) conducted site visits to the project area (PA) in conjunction with other agencies as well as some organizations and groups interested in the proposal; and 6) made numerous other contacts by telephone and in person with individuals interested in the proposed project. Since submission of the formal proposal by VA, the Forest Service has received approximately 560 letters or postcards of comment.

The significant issues identified through scoping and analyzed in detail in the EIS are as follows:

- 1) potential effects on lynx and its habitat;
- 2) the need for more reliable skiing conditions throughout the ski season and during periods when the Back Bowls are unavailable due to adverse visibility or snow conditions;
- 3) the availability of intermediate level ski terrain at the Vail Ski Area compared to skier preferences;
- 4) potential impacts on biodiversity on a landscape scale, including species diversity, habitat connectivity, structural diversity, old-growth forests, and rare or special habitats; and
- 5) the change in the character of the CAT III area from a roadless to a developed area.

Many other topics, concerns, and view points were identified during scoping. Those that relate to specific concerns about the impacts to the biological, physical, or human environment are "issues" in the NEPA process and are summarized below. Concerns about the technical feasibility of the proposal, the NEPA process, or about suggested alternatives are valid questions but are not "issues." Regardless of their status, non-significant issues and questions raised during scoping are addressed in an appropriate section of the EIS. Some of the other concerns include; water and air quality, soil erosion, off-site impacts on parking and transportation, affordable housing, and demand for community services.

The Project Area (PA)

The PA for the EIS includes the CAT III area (4,100 acres) and the lower portion of Tea Cup Bowl. A narrow utility corridor from the summit of Vail Mountain near Two Elk Restaurant down to Two Elk Creek has also been analyzed in appropriate resource areas. This is the area potentially directly impacted by the Proposed Action or alternatives to it. The CAT III area is comprised of three large bowls divided by major ridgelines. Moving east to west the bowls are Commando, Pete's, and Super bowls. The PA also includes other, smaller bowls, elevations, forested areas, and major features such as Two Elk Creek. Sun Up, Sun Down, Tea Cup, China, Siberia, and Mongolia bowls are within the developed portion of the ski area on the south face of Vail Mountain that is collectively referred to as the Back Bowls. The north face of Vail Mountain is extensively developed for skiing and is referred to as the front side.

SECTION II: THE PROPOSED ACTION AND ALTERNATIVES TO IT

Alternatives Eliminated from Detailed Analysis

During the scoping process (Spring, 1994) a number of alternatives to the Proposed Action were suggested. Four of these alternatives were considered, but not selected for detailed analysis for different reasons, but primarily because they did not meet the purpose and need for the proposal. They are described below.

- 1) Further development of the CAT I and II areas instead of developing the CAT III area, and changing the management area prescription to preclude any development within the CAT III area was recommended. It was not selected for detailed analysis because it would provide only 232 acres of skiable terrain—about half the amount that would result from the most limited of the development alternatives, Center Ridge (565 acres). Additionally, only about 60 acres would be intermediate terrain, and approximately 130 acres of the trail opportunities on the front side of the ski area were already approved through a previous environmental review and are not within the scope of the EIS.
- 2) Development of only Tea Cup Bowl was suggested, but not selected for detailed analysis for the same reasons as number 1 above. However, Tea Cup Bowl is included as an element of the Proposed Action and the other action alternatives, and is thus discussed sufficiently that it could be selected as a stand-alone project by the decision maker.
- 3) Access for skiing to the CAT III area only by snowcat was considered but dismissed because it would not provide enough additional reliable early and late season skiing, intermediate skiing terrain, or offer sufficient skiing opportunities for times when the Back Bowls are unavailable.
- 4) Development of terrain outside of VA's SUP boundary including land above East Vail and in Game Creek were specifically mentioned during scoping. This alternative was dismissed because it would conflict with the management prescriptions in the Forest Plan, would likely present significant technical and engineering challenges, may be incompatible with policies and regulations of other agencies and jurisdictions, and would fail to provide sufficient additional quality skiing, or more reliable early and late season skiing without snowmaking. It would also offer little added intermediate level terrain.

Alternatives Considered in Detail

DESCRIPTION OF THE NO ACTION ALTERNATIVE

Alternative A (No Action) is the baseline, status quo alternative required by NEPA regulations, against which all other alternatives are compared. Under this alternative, no development, ski area-related or otherwise, would occur in the CAT III area or Tea Cup Bowl. Instead, the area would continue to offer semi-primitive, non-motorized recreation opportunities. Also no vegetation management activities, such as timber harvest, would occur. Over the long term, vegetation would be affected primarily by natural forces. Livestock grazing would

continue at its current level, and the existing patterns and trends in dispersed recreation use would continue in the area. However, subject to Forest Service requirements for consideration of new information and appropriate analysis, the following previously approved lift installations and upgrades in the CAT I and CAT II areas would continue as planned:

- | | |
|----------------------------|--------------------------------|
| ◆ Lift 22 (Mongolia Bowl) | ◆ Lionshead Gondola (Lift #19) |
| ◆ Lift 6 (Golden Peak) | ◆ Lift 9 (Eagle's Nest) |
| ◆ Lift 10 (Northeast Bowl) | ◆ Sheer Terror Lift |
| ◆ Mushroom Bowl Lift | |

Trail development which would accompany some of these lift projects could in total add approximately 232 acres of skiable terrain in the CAT I and II areas. Of this, 130 acres would be on the front side of Vail Mountain and less than 50 percent would be intermediate level terrain. Some of these areas would likely require snowmaking, and very little would offer gladed skiing opportunities. Renovation and expansion of other existing facilities would also occur under this alternative and could require some additional employees. Routine maintenance and annual operations in the CAT I and II portions of the ski area would continue under the No Action Alternative including downhill skiing facilities as well as the current offering of summer recreation programs. This alternative also assumes that the seasonal elk calving closure in China Bowl will continue.

Action Alternatives

ELEMENTS COMMON TO ACTION ALTERNATIVES (B, C, AND D)

Unless otherwise noted, the elements described below are included with each action alternative. All alternatives described below assume that all projects and activities associated with the No Action Alternative will eventually occur also. Prior to implementation, detailed construction plans would be submitted and reviewed by the Forest Service. All facilities would be required to meet Forest Service design standards, including those listed in the Summer Construction and Operating Plan and other Best Management Practices (BMP).

Tea Cup Bowl Facilities

A ski lift, several trails, and one skiway/road for Tea Cup Bowl are elements of all action alternatives. A large portion of upper Tea Cup Bowl is already open to skiing. The proposed lift would allow use of the entire Tea Cup Bowl and West Wall of China Bowl. This lift would also provide access to the CAT III area and provide critical backup lift service from China, Tea Cup, Mongolia, and Siberia bowls and the CAT III area.

Restaurant

Under the Proposed Action and the MDP Alternative, a 20,000-square-foot restaurant, seating 300 to 400 people would be constructed near the confluence of Pete's Bowl and Two Elk Creek. It would compare in size to the Spruce Saddle Restaurant at the Beaver Creek Ski Area. The restaurant would operate only during the ski season and would provide service for skiers using the CAT III area as well as China, Tea Cup, Siberia, and Mongolia bowls. A restaurant is not part of Alternative B.

Picnic Decks

Picnic decks are permanent wooden platforms about 5,000 square feet, that would be located in either Pete's Bowl, Super Bowl, or both, depending on the alternative. The decks would serve as a platform along which a portable "picnic sled" could be positioned to provide food and beverage service for skiers. Attached to each deck would be a 2,000-square-foot warming hut and self-contained restroom facility.

Ski Patrol and Public Facilities

Under all action alternatives structures would be required for ski patrol personnel and equipment. One ski patrol facility would be required under the Center Ridge Alternative, while two would be necessary under the Proposed Action or the MDP Alternative. Public facilities would include a warming hut and small self-contained restrooms collocated, but separate from, ski patrol facilities near the upper lift terminals.

Bridges Crossing Two Elk Creek

Two bridges crossing Two Elk Creek are common to all action alternatives. Depending on the alternative, one or two additional bridges crossing Two Elk Creek would also be required. Generally, these bridges would be about 30 feet wide and about 60 feet long. In most cases, bridge abutments and supports would be built on the banks above and away from the stream channel. Due to its length, a bridge near the base terminal of Lift 21 would likely require a pier support at its midpoint. This bridge would provide skier access from China Bowl to the Intertie Skiway/Road and the CAT III area. Unlike the other bridges, this structure would be about 160 feet long. The second bridge common to all action alternatives would cross Two Elk Creek at the base terminals of the Ridge and Tea Cup lifts. This bridge would accommodate much of the construction phase traffic, and would be a crossing for skiers departing the CAT III area at the end of the day.

Super Bowl Skiway/Road Bridge

A bridge spanning a channel to avoid impacts to a narrow wetland and riparian area along the Super Bowl Skiway/Road would be required under all action alternatives.

Ski Lifts

A system of lifts to provide skier access would be included in all action alternatives. The lift alignments depicted for each alternative represent a zone of disturbance that would require clearing of vegetation and installation of lift towers. This configuration could allow for lifts of varying capacities over time. Initially, lower capacity lifts such as surface or fixed-grip lifts, could be built on a given alignment; then, as skier distribution and usage patterns became more apparent, they could be replaced with lifts of greater capacity. All proposed lift alignments would require a minimum clearing of trees of 50 to 90 feet. Other than to install tower footings, excavation would not usually be required for lift lines. The towers would be installed primarily using helicopters, while the upper and lower terminals would be constructed using conventional heavy equipment. Terminal placements could each require clearing or grading of up to 0.75 acres per terminal. In all cases, the location of specific tower sites would be adjusted during the actual construction survey to avoid or minimize impacts to wetlands, unsuitable or unstable slopes, or other sensitive areas.

Skiway/Roads

Under the action alternatives, developed skiway/roads would be needed for construction and maintenance of lifts, trails, and other facilities and to provide for skier circulation between key locations within the CAT III area. These routes would require clearing vegetation 60 feet wide with a 12-foot-wide running surface and would typically provide a 30-foot skiing surface. In cases where cross-slopes are less than 10 percent, grading would probably be unnecessary. Generally, skiway/roads would be out-sloped to minimize the need for culverts and would be constructed at a 7 to 11 percent grade to allow for skier circulation. Skiway/roads would be revegetated according to Forest Service standards and requirements. All skiway/road routes would be skiable. Some routes would be needed for travel and hauling during initial construction and would then be used in subsequent years only as skiways. Other routes would occasionally be used for maintenance and monitoring during the summer. The Intertie, Tea Cup, and Super Bowl skiway/roads would be necessary components of all action alternatives.

Ski Trails

Several classes or types of ski trails would be constructed to form each ski pod. Some conventional (graded) trails would be constructed in each pod under each alternative. *Conventional* trails would be cleared of vegetation to a width of 100 to 300 feet in order to produce a smooth ground surface that would allow grooming in low snow conditions. The amount of grading would vary depending on the natural condition of the existing slope, but would be substantial. All conventional trails would be revegetated according to the prescribed standards and requirements of the Forest Service. Removing stumps, while having less impact on soils than grading, would still expose soils temporarily. Consequently, the environmental analysis in the EIS treats stump removal at the same degree of disturbance as graded trails. *Glading* is another type of trail development and requires selective cutting, or thinning, of up to one-third of the existing trees. Generally, no grading would be required, but some selective stump removal or flush-cutting of stumps may be necessary to allow skiing. The width of gladed trails would vary according to design and the density of natural vegetation but would also generally range from about 100 to 300 feet. Glading is best suited to areas with widely spaced trees. Finally, much of the CAT III area has terrain that is *naturally open* and is therefore suitable and usable for skiing with little or no disturbance to vegetation or soils.

Utilities

Under all action alternatives, the utilities for lifts, the restaurant, and other facilities would be extended to and within the CAT III area via lines buried within existing or proposed ski facilities (graded roads, skiways, or ski trails). The Proposed Action and the MDP Alternative would require extension of water and sewer lines from the Vail Mountain ridge line near Two Elk restaurant to the proposed restaurant in the CAT III area. These lines would be buried in a proposed 40-foot utility corridor run through a partially disturbed area in China Bowl. Other than to service the restaurant, water and sewer lines would not be extended into the CAT III area. Sewage would be pumped back into the TOV sewage treatment system. Potential impacts associated with utility lines are integrated into the analyses for each discipline rather than addressed separately.

Construction and Phasing

If approved, construction could begin as early as the summer of 1996 at the discretion of VA, based on the conditions of the ROD. Depending on the alternative, construction could span five or more years and would be phased so that potential impacts could be controlled, minimized, and monitored. Construction at an individual

site might span several years; however, erosion, sediment control, and revegetation would be required each season. Buildings would generally be completed within the year they were started, except that concrete foundations might be installed one season and construction completed the next. Inspection and monitoring would continue beyond completion of construction. In most cases, construction would involve heavy equipment such as trucks, dozers, and backhoes. However, lift towers would be installed using helicopters. All activities would be consistent with the Forest Service requirements and the BMP specified in VA's approved Summer Construction Plans.

Timber Removal and Disposal

Under all action alternatives, timber would be cut from lift alignments, building sites, runs, trails, skiways, and roads. Timber removal associated with the project would be handled in accordance with Forest Service policy. Due to the potentially large volume of timber made available through development of the CAT III area, the EIS evaluates different methods of timber harvest and two possible haul routes from the CAT III area for each action alternative. One route would require construction of about 1.1 miles of temporary road connecting the project area to the existing Lime Creek Road. The other route would require use of the Sleepytime Road and utilize existing roads on the front side of Vail Mountain for hauling timber to I-70 and to a sawmill.

The table below compares the major elements of development by alternative.

Comparison of common elements in the project area by action alternative			
Development	Action Alternatives		
	Center Ridge	Proposed Action	MDP
<i>Number of Lifts</i>	3	4	5
<i>Ski Trails: Conventional</i>	196 acres	350 acres	553 acres
<i>:Gladed</i>	112 acres	222 acres	356 acres
<i>:Natural</i>	257 acres	345 acres	345 acres
<i>:Total</i>	565 acres	917 acres	1,254 acres
<i>Skiway/Roads</i>	6.4 miles	11.1 miles	18.2 miles
<i>Roads</i>	0 miles	1.1 miles	2.4 miles
<i>Number of Bridges</i>	3	4	5
<i>Ski Patrol Buildings</i>	1	2	2
<i>Picnic Decks</i>	1	2	2
<i>Restaurant</i>	0	1	1

DESCRIPTION OF ACTION ALTERNATIVES

Alternative B (Center Ridge) is reduced from the scope of the Proposed Action. It was developed to explore ways to further reduce wetlands and old-growth forest impacts and to contain potential impacts to a smaller

geographic area. It would add approximately 565 skiable acres, about 500 acres of which would be intermediate level terrain. About 65 percent of the added terrain would be naturally open or gladed skiing. Lifts would be installed in Super Bowl, on Center Ridge, and in Tea Cup Bowl. Two bridges would span Two Elk Creek, with another bridge required to cross a tributary of Two Elk Creek on Superbowl Skiway/Road.

Alternative C (Proposed Action) is the proposal submitted to the Forest Service by VA and is a site-specific variation of the 1986 MDP concept. It was based on several years of study and coordination among VA, the Forest Service, and other agencies. It is similar to Alternative B with exception of a lift and ski trail system in Pete's Bowl. Three bridges across Two Elk Creek and one on the Super Bowl Skiway/Road would also be built, as would a restaurant seating 300 to 400 people to the Two Elk Creek area.

Alternative D (Master Development Plan [MDP]) is a site-specific version of the 1986 MDP concept for the development of the CAT III area. This alternative was included for detailed study in order to examine more complete utilization of the CAT III area and to be more responsive to the need for additional ski terrain when the Back Bowls are not available. The MDP Alternative would place four lifts in the CAT III area and one in Tea Cup Bowl and, unlike the other two alternatives, would not share common lift locations with sites being considered under other alternatives. Four bridges across Two Elk Creek and one on the Superbowl Skiway/Road would be built, as well as a restaurant seating 300 to 400 people in the Two Elk Creek area.

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CHAPTER 1.0 PURPOSE AND NEED

This chapter describes the purpose and need for the Proposed Action, outlines the environmental review process, summarizes applicable Forest Service management direction and policy, lists the issues identified through scoping, and indicates the approvals that may be required by other agencies and state and local government.

1.1 INTRODUCTION

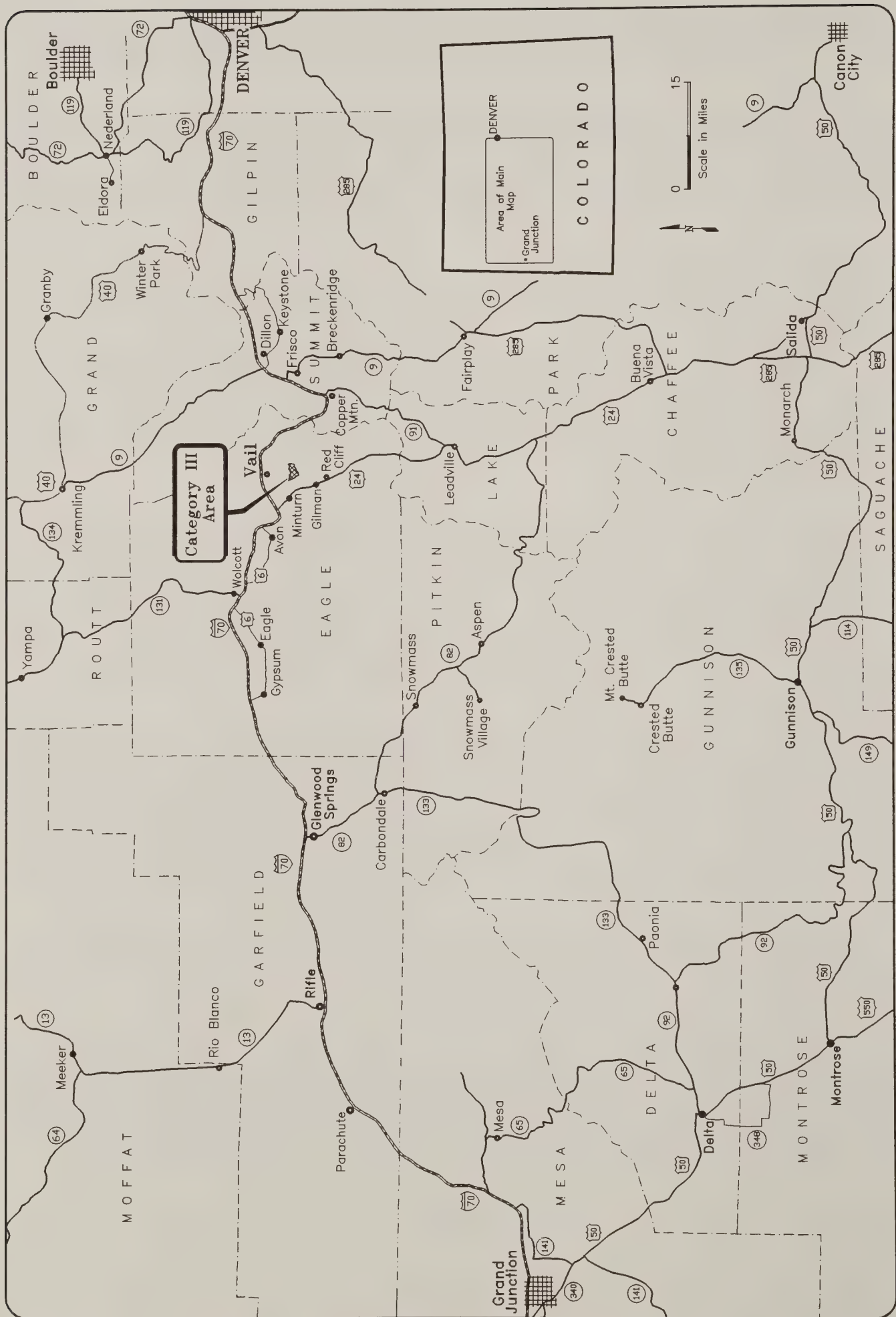
This Environmental Impact Statement (EIS) documents the analysis of the environmental and socioeconomic effects of a proposed action and alternatives to that action. An EIS discloses these effects but does not constitute a decision on whether or under what conditions to approve a proposed action. Following public review and comment on this Draft EIS, a Final EIS will be issued. Either concurrent with release of the Final EIS or subsequent to it, a Record of Decision (ROD) will be issued to document the decision maker's choice between the proposed action and an alternative to it. The Forest Supervisor of the White River National Forest (WRNF) is the decision maker for this proposal.

A Master Development Plan (MDP) accepted by the Forest Service in 1986 divided Vail Associate's Special Use Permit (SUP) area into three distinct categories, i.e., CATs I, II, and III. The MDP was reviewed in an Environmental Assessment (EA) (USDA-FS 1986a) and in the Decision Notice (DN). Vail Associates, Inc. (VA), the proponent/permittee, was required to submit a detailed plan prior to the development of the CAT III area. The proposal (Proposed Action) is a site-specific request from VA to the WRNF to develop ski facilities generally located within the CAT III area. Maps and descriptions of this area and the other portions of the ski area follow in the Proposed Action section. VA operates Vail, Beaver Creek, and Arrowhead ski areas within Eagle County, Colorado.

The analysis contained in this EIS complies with the environmental review requirements of the National Environmental Policy Act (NEPA 1969, as amended) and the Council on Environmental Quality (CEQ) regulations. In addition to providing an analysis upon which to base the Forest Service decision, this EIS is intended to provide information for decisions of the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (ACOE) and to facilitate local government planning. The ACOE, a "cooperating agency" (40 CFR 1501.6) in the preparation of this EIS, has participated in site visits and meetings regarding wetlands, and has provided direction in the assessment of wetlands and related issues.

The CEQ regulations for preparing an EIS do not mandate a particular finding or decision and do not involve a public vote. The regulations require agencies to contact, inform, and involve the public as a part of their environmental review and decision making processes.

The Town of Vail (TOV) is located in the Gore Valley about 90 miles west of Denver, Colorado, via Interstate Highway 70 (I-70), in Eagle County, Colorado (Figure 1.1). Vail Ski Area is a four-season resort owned and operated by VA and located in and immediately south of the TOV. The resort operates on 12,590 acres of public land on the WRNF under the terms of a SUP and on private land located along the base of the ski area. The area includes all or portions of Sections 7, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, 36 of T.5S., R.80W.; Sections 3, 4, and 5 of T.6 S., R.80 W.; and Section 12, T.5 S., R.81 W.



1.2 THE PROPOSED ACTION

On February 18, 1994, VA submitted a proposal (VA 1994a) for construction of facilities in the CAT III area portion of the SUP area (Appendix A). This undeveloped area is approximately 4,100 acres. The Proposed Action would involve development of approximately 1,000 acres of lift-accessed ski terrain within this area and includes the construction of four ski lifts, an access road, ski trails and a ski-way system, a restaurant, ski patrol buildings, two warming shelters/food service facilities, utilities, and three bridges spanning Two Elk Creek. Because of the area's elevation and aspect, no snowmaking is required or included in this proposal. Water and sewer service would be brought to the restaurant by extending existing utilities from the top of Vail Mountain. No summer recreation programs or activities are proposed in the CAT III area, and there is no snowmaking or motorized access connected to the proposal, aside from access required for construction and operation of the ski area.

The CAT III area is about five miles south of the TOV and occupies the southern extent of the Vail Ski Area SUP area. It is located entirely within the upper (eastern) end of the Two Elk Creek drainage. The CAT III area includes three bowls locally referred to as Super, Pete's, and Commando bowls. The area is generally south of Two Elk Creek and opposite Tea Cup, China, Siberia, and Mongolia bowls, which are within the developed ski area. Figures 1.2 through 1.5 depict the current location of facilities at the ski area. Figure 1.2 illustrates the relationships among the CAT I, II, and III areas. Figures 1.3 through 1.5 are individual views of the areas and depict existing developed facilities. Note that the Project Area (PA) extends outside of the CAT III area and includes Tea Cup Bowl and a narrow strip in China Bowl for utilities that extends from the top of the CAT II area into the CAT III area. Figure 1.5 shows the PA as it relates to the CAT III area boundary.

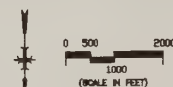
The proposal states that VA intends to build annual skier visitation during non-peak periods. Vail Ski Area's capacity (USDA-FS 1986a) is established and controlled at 19,900 skiers-at-one-time (SAOT) by the Forest Service-accepted MDP. This capacity threshold is discussed in the 1986 EA as the "manage to " concept and described in the DN as part of a flexible framework for managing peak-day skier numbers. Hereafter, the 19,900 SAOT established in the 1986 DN is referred to as the *manage-to capacity*. The Proposed Action is described in detail in Chapter 2 as Alternative C. In an informational brochure released prior to and during formal scoping activities VA indicated that, "The Category III project is not expected to increase the number or size of peak days ... the number of skiers during peak periods will continue to be constrained by access to the main mountain. This, in turn, is limited by initial lift service, parking, and the local transportation system."

Peak day demands on the TOV infrastructure were an important focus in the analysis for the 1986 EA and were critical in arriving at the 19,900 manage-to capacity. A series of mitigation measures outlined in the EA have since been implemented by VA, the TOV, and others. These measures, together with further cooperation between the TOV and VA have culminated in a formal agreement (Agreement) known as The Program to Manage Peak Periods (TOV/VA 1995). The Agreement calls for the TOV and VA to work together to better manage the demands of peak days, make more efficient use of existing infrastructure, better balance visitation throughout the ski season, and maintain a high quality experience for Vail visitors during peak periods. The formulation of the Agreement included citizen input and, it specifically requires the creation of an assessment committee with representatives from the TOV and VA to monitor the program. A summary of the Agreement (Strategies for the Future) produced to introduce it to the public, as well as the TOV resolution approving and adopting it is included in Appendix A. The CAT III project is identified as an essential component of the implementation of the Agreement that could effectively assist in building off-peak skier visitation. As well, the Agreement notes that the "TOV believes that the scope of the Forest Service's environmental review need not

Vail Pass &
I-70
4.0 miles
Shrine Pass Road

Vail Ski Area Category III Development Environmental Impact Statement

October 1995



#18 - Ski Lift

□ - Project Area

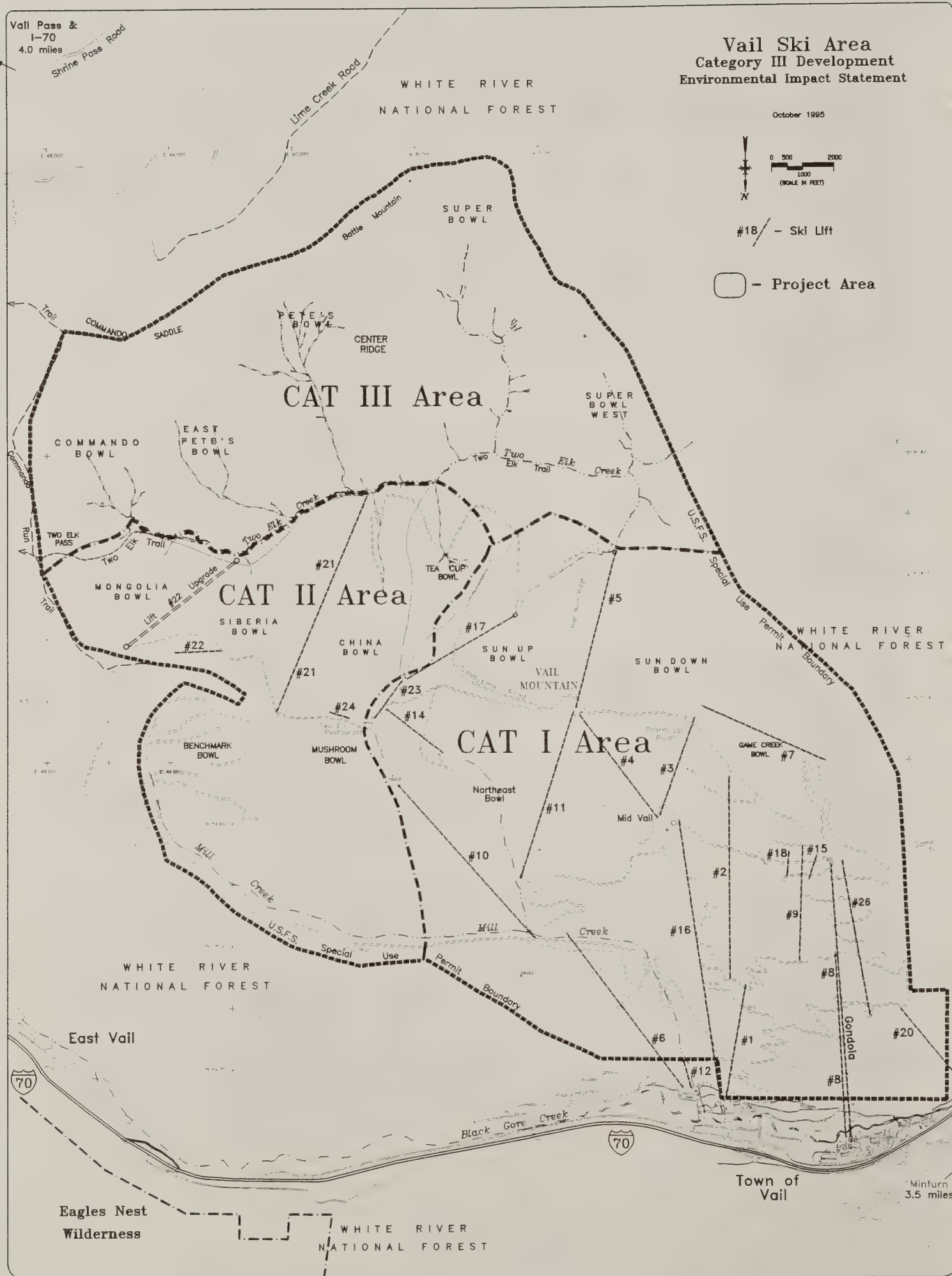


Figure 1.2. Location of the proposed project area relative to the remainder of the special use permit area.

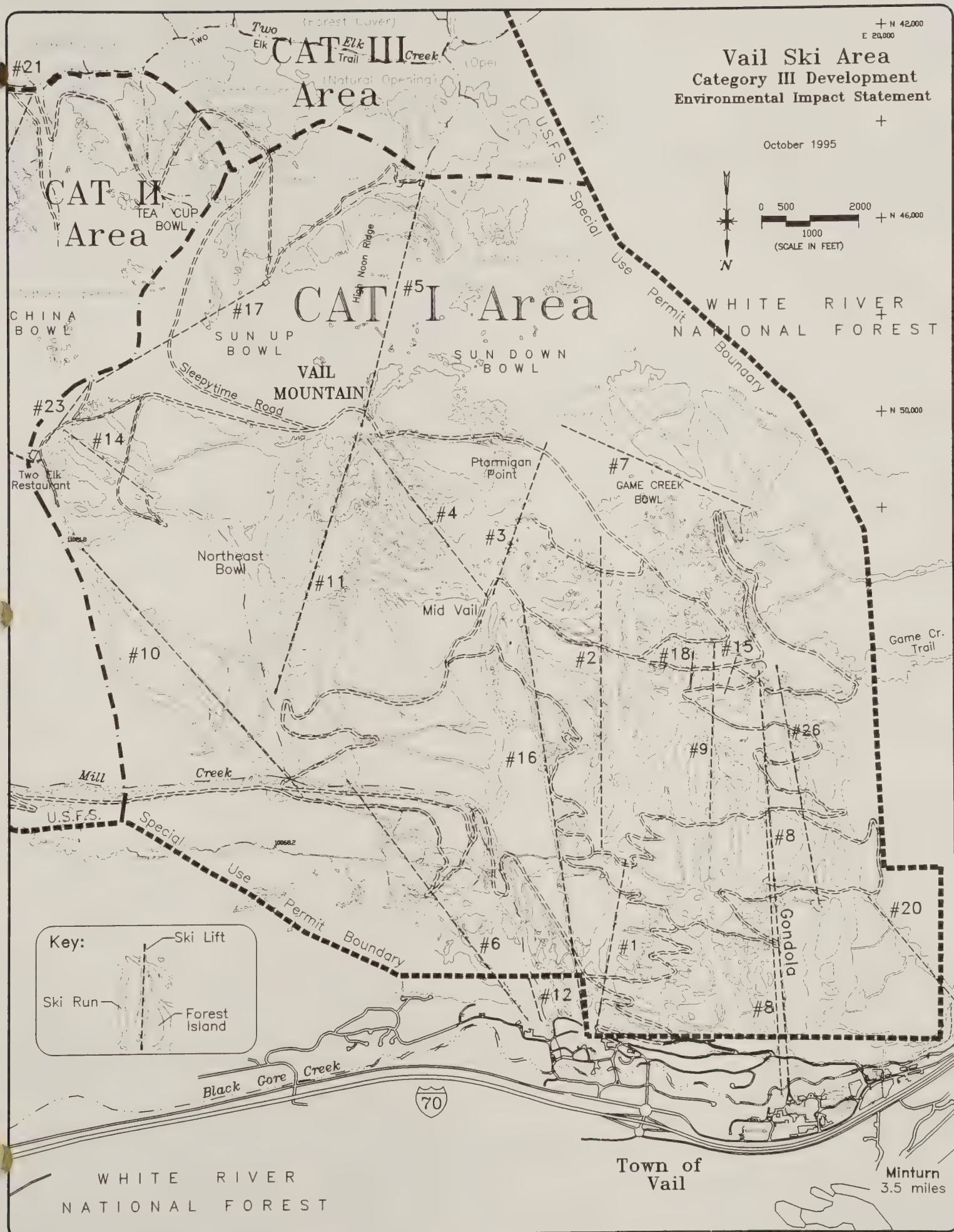


Figure 1.3. A depiction of the Category I area within the Vail Ski Area.

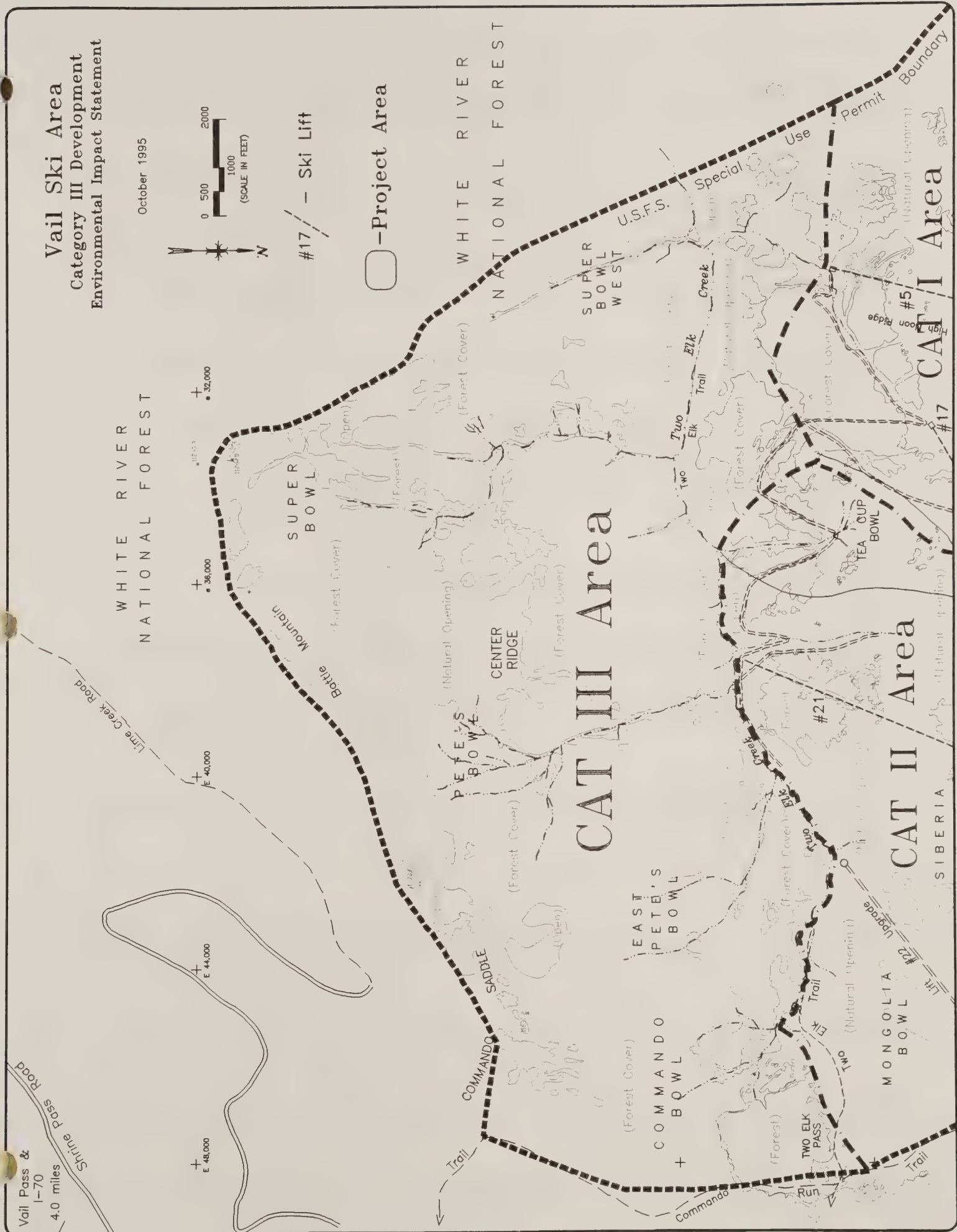


Figure 1.5. A depiction of the Category III area, including the Proposed Project Area.

focus on off-site issues related to the TOV since they have been previously identified, studied, and discussed through the public process, and since this Agreement will ensure growth management processes established herein are followed.”

1.3 PURPOSE AND NEED

The objectives of the Proposed Action are outlined in VA's proposal letter (Appendix A) to the Forest Service. Prior to accepting the proposal and agreeing to move forward with it into a NEPA analysis, it was reviewed by the Forest Service (USDA-FS 1993b) using available information. Based on this review, it was determined that:

- 1) the proposal is consistent with the land allocation decision in the White River National Forest Land and Resource Management Plan and in the Vail SUP;
- 2) there are no apparent significant new circumstances or changed conditions that indicate that the Forest Plan allocation for the CAT III area should be changed;
- 3) the proposal includes reasonable efforts to minimize resource impacts; and
- 4) if approved and constructed, the CAT III area would function as an effective addition to Vail Ski Area.

Consequently, the proposal was accepted and adopted by the Forest Service as the Proposed Action, and the EIS process to evaluate the Proposed Action and alternatives to it was initiated.

1.3.1 PURPOSE

The objectives (purposes) of the Proposed Action, as detailed in VA's proposal, are explained below.

The first objective is to enhance the quality of skiing opportunities within VA's existing SUP area by:

- 1) offering more reliable and consistent skiing conditions, especially early in the season, without creating additional snow-making demands;
- 2) improving skier distribution throughout the entire ski area;
- 3) providing additional intermediate ski terrain;
- 4) improving skier distribution and utilization of China, Tea Cup, and Sun Up bowls and by providing a more direct end-of -day egress route from China and Tea Cup bowls and the CAT III areas to Vail Village and the Lionshead base area; and
- 5) providing backup lift service for Tea Cup, China, Mongolia, and Siberia bowls and the CAT III area, to and from, the front side of Vail Ski Area.

The second objective is to make more efficient use of existing local and on-mountain infrastructure at Vail Ski Area during traditionally low periods of use.

The third objective is to support community and ski area efforts to stabilize seasonal economic fluctuations and build annual skier visitation at Vail Ski Area without increasing peak-days.

There are approximately 4,014 skiable acres within the developed portion of Vail Ski Area. Approximately two-thirds of Vail's existing skiable terrain is located in the south-facing Back Bowls which, particularly during early and late season and during periods of poor snow or visibility conditions are vulnerable to closure. When this occurs, skier densities increase on the front side of the ski area, and the quality of the experience is reduced. This problem can be especially acute if the Back Bowls are not available during the Christmas to New Year's peak period or other high use periods. Adding skiing terrain on high elevation, north-facing slopes addresses these reliability and consistency concerns. The undeveloped front side terrain with those characteristics is limited as indicated in Chapter 2.

Intermediate skiers are a major component of ski area visitors. In the 1994-95 season intermediate skiers comprised 50 percent of all skiers at Vail Ski Area, while only about 34.5 percent of Vail's ski terrain and 39 percent of its trail capacity is intermediate.

Currently, Lift 21 provides the only means of skier evacuation from Tea Cup, China, Mongolia, and Siberia bowls. These areas constitute approximately 1,612 acres of skiable terrain. The Tea Cup Lift is designed as a stand-alone facility and is needed as a backup to Lift 21, as well as to better distribute skiers throughout the Back Bowls. It would also provide access to the CAT III area.

Vail Ski Area's current manage-to capacity of 19,900 SAOT is roughly in balance with the capability of the TOV's parking, road and mass transit systems, and the community's lodging, restaurant, and service sectors. The Proposed Action is intended to increase skier visitation during non-peak periods and annually, but not to increase the 19,900 SAOT manage-to capacity. Peak days are defined in Chapter 3 for the purpose of this EIS as those days when skier visitation exceeds about 18,000 skiers. The Proposed Action could also increase the number of high use days, defined for the purpose of this EIS as 15,000 to 18,000 skiers. The infrastructure of the ski mountain and the TOV can normally handle this level of activity, but it is a "busy" day. However, on-mountain services can become taxed during high-use days if factors such as bad weather or poor snow conditions, which limit use of the Back Bowls, occur at the same time.

Opportunity exists to build skier visitation during traditionally low periods of use. Over the past several years, VA has demonstrated progress in this area and has been able to build season-long visitation while reducing the number of days over 15,000 skiers. The addition of ski terrain with early and late-season dependability and that offers new bowl and gladed skiing opportunities, factors which are identified as important in skier surveys, would help to continue this trend.

1.3.2 NEED FOR THE PROPOSAL

The Proposed Action is needed:

- 1) to respond to a proposal which has the potential for offering more effective recreation utilization of public lands without creating additional demands and impacts on off-site lands and communities;
- 2) to help to achieve Forest Service goals by providing high quality recreation experiences for visitors to the National Forest, specifically within the Vail Ski Area SUP area; and

3) to fulfill the broad management goals of the WRNF Land and Resource Management Plan.

The 1992 Rocky Mountain Regional Guide addresses the role of the Forest Service in providing quality recreational opportunities as follows:

"National Forests play a significant role in the development and administration of the recreation resort industry in the Rocky Mountain Region, especially downhill (alpine) skiing, and help to maintain the national and international image of the Region as one of the world's premier winter recreation destinations."

The Proposed Action is consistent with the land allocation decision in the Forest Plan and the MDP for Vail Ski Area.

1.4 BACKGROUND

The original Forest Service SUP was issued to Vail Associates Ltd. on January 25, 1962. The permit area was approximately 7,700 acres in size and encompassed most of the front side of the existing ski area as well as Sun Up and Sun Down bowls in the Two Elk Creek drainage. The SUP boundary extended south, across Two Elk Creek, and included Super Bowl and the western portion of Pete's Bowl (now a part of the CAT III area).

In 1985, VA submitted a MDP proposal to the Forest Service. It contained a site-specific development plan for all of the areas already under permit and proposed adding 4,890 acres of land to the SUP. The additional areas are now known as Pete's, Commando, Siberia, China, Mongolia, Mushroom, and Benchmark bowls (Figure 1.2).

Besides requesting additional acreage, the MDP included a schedule for phased development of the entire SUP area. The first phase included lift upgrades and trail modifications to the previously developed front side of the ski area. The terrain encompassed by this phase was designated as the CAT I area. Improvements and development forecasted for completion within two to seven years were to involve Mushroom, Benchmark, Mongolia, Siberia, upper Tea Cup, and China bowls, as well as the Golden Peak and Westin lifts. That section was designated as the CAT II area. Finally, improvements proposed for completion more than ten years in the future included Commando, Pete's, and Super bowls, a small portion of upper Game Creek, and the lower portions of Sun Down and Tea Cup bowls. This grouping was designated as the CAT III area. The MDP proposal was analyzed in an EA and accepted in a DN issued on December 1, 1986.

In the DN, the Forest Supervisor authorized enlargement of VA's SUP area to 12,590 acres and approved construction of facilities in the CAT I and CAT II areas. The EA analyzed a more conceptual development scheme for the CAT III area. As stated in the DN:

"Site-specific expansion into Pete's, Commando, and Super bowls is not approved in this decision. Site-specific analysis pursuant to the National Environmental Policy Act will be required prior to any development occurring within these areas. As such, there is no commitment by the Forest Service for the site-specific development of Pete's, Commando, or Super bowls."

Further, the DN specified that VA must complete the MDP for the CAT III area developments within 15 years, "or these areas may be deleted from the permit at the discretion of the Forest Supervisor."

On May 15, 1987, the MDP was revised. While this did not affect the CAT III area, it did outline several changes on the front side of Vail Mountain made necessary by high-speed lift technology and changing restaurant needs.

Finally, through an EA, DN, and Finding of No Significant Impact (FONSI) issued on October 2, 1992, VA's 30-year SUP was reissued as a new 40-year term permit. This was completed under the authorization of the National Forest Ski Area Act of 1986, and did not affect either the SUP boundary or the planning and approval process that would be necessary for the CAT III area.

1.5 NEPA PROCESS

This proposal involves federal actions (decisions) that could significantly affect the quality of the human environment on public lands administered by the Forest Service and thus requires that an EIS be prepared. This EIS contains analyses that are consistent with NEPA, the CEQ regulations, and Forest Service environmental review policy (USDA-FS 1992a).

NEPA requires that complete environmental information be made available to federal, state, and local agencies; organizations; and individuals who may be interested in or affected by the Proposed Action. Opportunities to review this information and submit comments must be provided before decisions are made or actions are taken on public lands.

As the lead agency for this EIS, the Forest Service has many responsibilities pertinent to the process. NEPA allows the lead agency to select an independent third-party contractor (consultant) to assist in the preparation of the EIS (40 Code of Federal Regulations (CFR) 1506.5[c]). The cost of the contractor is paid by the applicant; however, the consultant works under the direction of the lead agency. The agency directs the consultant's efforts, reviews and approves the work, and ultimately adopts the EIS as an agency product. The consultant is required to execute a disclosure statement specifying that they have no financial or other interest in the outcome of the project. Pioneer Environmental Services, Inc. in Logan, Utah, was selected by the Forest Service as the third-party consultant for this EIS.

NEPA regulations (40 CFR 1501.2[d]) strongly encourage agencies to advise potential private applicants of the likely information requirements and studies that may be necessary for later federal review and action. The objective is to ensure that the planning of proposed actions reflects the environmental values of an area, minimizes potential conflicts, and avoids delays in preparing an EIS. VA's proposal includes an extensive list of resource studies completed since 1985. Agencies are further directed to utilize information collected by applicants, their consultants, or other parties (40 CFR 1506.5[c]) as long as the agency makes an independent evaluation of the content and scientific credibility of the information. All such information used in this EIS has been subject to Forest Service review.

1.6 MANAGEMENT POLICIES AND DIRECTION

The enabling authorities for the Forest Service are contained in many laws enacted by Congress and in the regulations and administrative directives that implement these laws. The major laws include the Organic Administrative Act (1897 as amended), the Weeks Act (1911), the Multiple-Use Sustained Yield Act (1960), the Forest and Rangeland Renewable Resources Planning Act (1974), and the National Forest Management

Planning Act (1974). In addition, the National Forest Ski Area Permit Act (1986) provides important direction for the administration of ski areas operating under SUPs on National Forests. An inherent Forest Service objective addressed in these laws is to provide a continuing flow of natural resource goods and services to help meet the needs of the nation. One aspect of this charge is accomplished by making the renewable resources of the National Forest System (NFS) available for a range of outdoor recreation. The Forest Service provides recreational opportunities to facilitate the use, enjoyment, and appreciation of National Forests.

The Forest Service is authorized to approve certain uses of NFS lands to accomplish its multiple-use mission under the terms of SUPs (16 U.S.C. 497). SUPs for recreational developments are issued and administered for uses that serve the public, promote public health and safety, and protect the environment.

Downhill skiing is an important component of the recreational opportunities offered by National Forests. The National Recreation Strategy (USDA-FS 1988), a result of the 1987 President's Commission for America's Outdoors, gives the Forest Service a major role in providing recreation opportunities on National Forests through partnerships such as those with the ski industry.

Alpine skiing has been, and will continue to be, an important recreational use of public lands managed by the Forest Service. In 1994, the Rocky Mountain Region of the Forest Service reported that downhill skiing accounted for 18 percent of the Region's total recreational use. This occurred on 83,848 acres of public land managed under SUPs, or about 0.4 of one percent of the Region's land base. Visitation at Vail Ski Area annually accounts for about 18 percent of Colorado skier visits.

1.6.1 NATIONAL FOREST ECOSYSTEM MANAGEMENT POLICY

On June 4, 1992, in response to emerging scientific research and heightened public interest, the Forest Service initiated a policy of integrating an ecosystem philosophy into its management of public lands. Ecosystem management is intended to promote the use of an ecological approach to achieve the multiple-use management of National Forests and grasslands by balancing the needs of people and environmental values in a manner that emphasizes diverse, healthy, productive, and sustainable ecosystems.

An ecosystem is a community of organisms and associated environments that functions as an interdependent unit. Ecosystems occur at many different scales, including ponds, timber stands, watersheds, and mountain ranges. In accordance with the policy, ecosystems are to be managed to sustain their diversity, health, and productivity in both the short and long terms.

Ecosystem management recognizes that people are an integral part of ecosystems and that the social and economic needs of local communities should be balanced with environmental values. The Forest Service will ensure equitable and sustainable access to resources for people who depend on the land for subsistence, livelihood, commerce, and recreation. Ecosystem management is consistent with current mandates for managing NFS lands. It responds to recent advances in scientific knowledge about ecosystems and landscape ecology as well as changing societal values on how to achieve the Forest Service's multiple-use mission.

"Traditional multiple use sought to sustain selected forest use and product flows. Ecosystem management seeks to sustain not only the resource use and products, but also the health, beauty, and long term productivity of ecological systems. In concept and practice, ecosystem management is a more complex approach than traditional multiple-use management" (USDA-FS 1993a).

Recreation developments, such as ski areas are one type of "resource use" encompassed under the concept of ecosystem management. Chapter 4 of this EIS evaluates the potential impacts of this project on indicators of healthy ecosystems.

1.6.2 ROCKY MOUNTAIN REGIONAL GUIDE (REGIONAL GUIDE)

The Regional Guide (USDA-FS 1992b) establishes the general policies and programmatic direction for the consideration or study of ski area development in the Rocky Mountain Region of the U.S. Forest Service. It also prescribes a four-level system of priorities for the study of potential new ski areas, or expansion of existing ski areas that is to be carried into the Land and Resource Management Plans for each National Forest. The Regional Guide was put into place in a Final EIS (USDA-FS 1983) and supplemented in 1992 (USDA-FS 1992). The CAT III area was identified in the highest priority class in both the 1983 and 1992 versions of the Regional Guide.

The Regional Guide notes that it is the policy of the Forest Service in the Rocky Mountain Region to "provide new downhill skiing capacity at existing areas, sites under permit, and at locations currently being studied (1992) as a first priority" (USDA-FS 1992b, pp. 3).

The Proposed Action is consistent with the programmatic direction contained in the Rocky Mountain Regional Guide.

1.6.3 WRNF LAND AND RESOURCE MANAGEMENT PLAN (FOREST PLAN)

Forest Plans provide the basic framework for management of National Forests. Within each Forest Plan, management direction for the Forest is established and standards and guidelines for activities are defined. In a manner similar to local government zoning, Forest Plans prescribe a management emphasis for all portions of the Forest. For example, some of the management area prescriptions in the White River Forest Plan (USDA-FS 1984) include non-motorized recreation, timber production, wildlife winter range, and downhill skiing. All uses of the National Forest must be ultimately consistent with the Forest Plan.

The Forest Plan for the WRNF was approved in 1984, following preparation of an EIS and a ROD. CEQ regulations (40 CFR 1502.20) direct agencies preparing EISs to not repeat decisions and analyses done in broad-level, programmatic NEPA documents, such as Forest Plans and associated EISs. Instead, agencies are instructed to simply reference them in a process called "tiering." In this case, the CAT III area EIS is tiered to the WRNF Forest Plan EIS.

The analysis contained in the Forest Plan EIS assumed that the CAT III area would be developed within the subsequent 10 to 15 years as an addition to Vail Ski Area, designated the area to remain under 1B prescription. The 1B Management Area Prescription for designated winter sports sites includes the following:

"Management emphasis provides for downhill skiing on existing sites and maintains selected inventoried sites for future downhill skiing opportunities. Management integrates ski area development and use with other resource management to provide healthy tree stands, vegetative diversity, forage production for wildlife and livestock, and opportunities for non-motorized recreation" (USDA-FS 1984, pp. III-82).

Amendment No. 90-2 to the Forest Plan (USDA-FS 1984) gives additional direction for developed recreational resources on the Forest, including the following goals:

- 1) to provide a wider variety of site amenities that satisfy the desires of recreation visitors; and
- 2) to provide additional downhill skiing opportunities in accordance with Forest Plan direction with emphasis on expansion of existing sites to meet demand.

The process of developing the Forest Plan was important in determining where future ski area developments might occur. For example, using the Regional Guide, the Forest Plan EIS evaluated the study priority assigned to eight potential new winter sports sites in Eagle County and expansions to the Vail and Beaver Creek ski areas. Of these, only the expansions to existing areas and the Adam's Rib site were allocated to a 1B Management Area Prescription in the Forest Plan. The other potential sites were designated for a variety of uses, including wildlife habitat, timber production, and non-motorized recreation.

The Proposed Action is consistent with the programmatic direction and land allocation contained in the White River Forest Plan and was reviewed by the Forest Service (USDA-FS 1993b) prior to accepting a formal proposal (VA 1993a). Ensuring consistency with the Forest Plan and the Forest Service's overall mission is a dynamic process, requiring reviewing and monitoring through the NEPA process. An analysis of the consistency of the Proposed Action with the Forest Plan, as amended, is included as Appendix E.

1.6.4 VAIL SKI AREA MASTER DEVELOPMENT PLAN

Vail Ski Area's MDP was accepted by the Forest Service following preparation of an EA and DN (USDA-FS 1986a). The Forest Service granted VA approval for developments in CAT I and CAT II areas, but deferred site-specific approval for developments in the CAT III area. This EIS incorporates key portions of analyses done for the MDP. Of particular importance in this EIS is the earlier analysis that supported establishment of a manage-to capacity of 19,900 SAOT.

The development scheme conceptually analyzed in the EA assumed that lift access would be provided to nearly all portions of the CAT III area and that ski trail construction would take place in Super, Pete's, and Commando bowls. Though the extent of the Proposed Action is reduced from that in the MDP, it is consistent with the objectives of the plan, including the Quality Management Guidelines established by VA in 1985 (VA 1985). The potential impacts of full development of the MDP are evaluated in this EIS as Alternative D.

1.7 SCOPE OF THIS EIS

The scope of analysis in an EIS is determined by a variety of factors. It includes the purpose and need for the proposed action, the issues identified during scoping, and the formulated alternatives. In addition, the results of previous programmatic analyses and decisions pertaining to the area, such as the Forest Plan and MDP, play an important role in determining the scope of analysis for an EIS. The key decisions that need to be made and the function of this document are defined below.

1.7.1 DECISIONS TO BE MADE

This EIS is not a decision document. Its main purpose is to disclose the potential consequences of implementing a Proposed Action and alternatives to it. However, the EIS is prepared on the premise that certain decisions must be made and that they will be documented in a Record of Decision (ROD). Accordingly, this EIS focuses on providing analyses sufficient to make the following federal decisions:

- 1) Whether and under what conditions the Forest Service will approve the CAT III area and Tea Cup Bowl development plan submitted by VA, or an alternative to it;
- 2) If the ski area development is approved, to what extent the Forest Service will require that timber cleared for trails and other facilities be utilized, and by what route it will be removed from the CAT III area; and
- 3) Whether and under what conditions to approve a federal permit for those activities affecting wetlands and waters of the United States, under Section 404 of the Clean Water Act. This is a decision of the U.S. Army Corps of Engineers (a cooperating agency for this EIS).

Based on the disclosure contained in this EIS, Forest Plan management requirements, standards, and guidelines, or management area prescriptions could be amended for the Vail Ski Area. Any amendment to the Forest Plan will be specified in the Record of Decision.

The environmental analysis in this EIS is intended to document the environmental evaluation of only the actions and activities being considered within the project area. Certain developments proposed in the 1985 MDP and approved in the 1986 EA and DN have not been completed. This EIS will not be used to revisit those previous approvals and decisions. It will, to the extent appropriate for each resource or discipline, consider the combined (cumulative) effects of the CAT III area developments and these other projects. A list of these and other potential developments is included in Table 2.2 in Chapter 2. Before implementation of these projects is allowed, they are subject to Forest Service requirements for consideration of any new information and appropriate environmental analysis (USDA-FS 1992a). These previously approved developments are part of the continuation of the status quo as described in the No Action Alternative in Chapter 2.

The decisions to be made in this EIS are based on the assumption that the currently approved manage-to 19,900 SAOT capacity will not be exceeded. The provisions of the Agreement, current limits on local infrastructure, and Forest Service SUP authorities indicate that this is a reasonable assumption. Any future request to increase the approved SAOT capacity would be subject to provisions of the SUP and would require analysis and disclosure under NEPA for both National Forest and off-site impacts that could result.

1.7.2 FUNCTION OF THIS EIS

This EIS is intended to:

- 1) document the development and evaluation of the Proposed Action and alternatives to it as the basis for a federal decision;

- 2) provide the site-specific environmental analyses for those facilities and activities encompassed by the range of alternatives;
- 3) describe, analyze, and disclose the biological, physical, social, and economic impacts that would likely be associated with implementing each of the alternatives;
- 4) identify where possible, the long-term, direct, and indirect effects of the various alternatives (40 CFR 1508.8);
- 5) disclose the effects of past, present, and reasonably foreseeable future actions that interact in a cumulative fashion with the direct impacts (40 CFR 1508.7);
- 6) indicate possible mitigating measures that may be used to avoid, minimize, eliminate, or reduce adverse impacts (40 CFR 1508.20); and
- 7) provide a comprehensive, reliable, and informative document for public agencies, groups, and individuals who are interested in the project, or who may choose to use the document in their planning and decision making processes.

The range of alternatives is partially driven by scoping, which includes both public and other agency input, and is also determined by previous programmatic environmental analyses and decisions. The Regional Guide, Forest Plan, and the Vail Ski Area MDP, EA, and DN provide this programmatic direction.

The CEQ regulations require that agencies "rigorously explore and evaluate all reasonable alternatives" (40 CFR 1502.14). In this context, "reasonable" is closely tied to the objectives of the action proposed and the need identified. Chapter 2 describes a number of potential alternatives that, though technologically feasible, would not substantively address purpose and need. These alternatives were carefully considered but eliminated from detailed study.

The type and intensity of data collected for the EIS and the requirements for its analysis are other aspects of the scope of the analysis. For instance, "NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail" (40 CFR 1500.1[c]). As well, agencies are directed to reduce paperwork by "preparing analytic rather than encyclopedic environmental impact statements" (40 CFR 1502.2 [a]), and by "discussing only briefly issues other than significant ones" (40 CFR 1502.2 [b]). Accordingly, this EIS focuses its disclosure on those issues, data, and analyses that provide the decision maker a clear and reasoned choice among the alternatives.

A ROD will be issued by the WRNF Supervisor along with or subsequent to release of the Final EIS. The ROD will approve, deny, or approve in modified form, the site-specific development activities evaluated in this EIS. The ROD would authorize only those actions occurring on public lands administered by the Forest Service. However, mitigation measures may be identified that could be applied or required by other federal agencies as well as state or local governments. In the ROD, the decision maker may combine elements of several alternatives as long as the environmental effects have been sufficiently disclosed in the EIS. For instance, the impacts associated with Tea Cup Bowl facilities are included as discrete elements of several other alternatives. It also could be approved as a stand-alone development.

Vail Ski Area's MDP will be revised to be consistent with the ROD. If it includes approval for development, no further NEPA analysis will be required before implementation unless development differs from the range of alternatives analyzed in this EIS. Forest Service review of site plans and construction designs would be required before construction could actually begin. During implementation of the project, if the magnitude of an environmental impact would be greater than estimated in the EIS, the Forest Service would evaluate: 1) whether changes in the decision are necessary, 2) whether to require further mitigation, or 3) whether to suspend the project in total. If approved, construction could begin as early as the summer of 1996 and, depending on the alternative selected, could run five or more years.

1.7.3 ISSUES

NEPA requires that the public and other agencies be involved in agency decision making. An important part of this process is scoping. CEQ regulations refer to scoping as a process to determine the "scope of the issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7).

On February 18, 1994, VA submitted a proposal to the Forest Service to extend downhill skiing facilities into the CAT III area. Major steps in the scoping process included:

- 1) circulating a scoping information summary to approximately 300 individuals, organizations, and agencies beginning in February 1994;
- 2) meeting with the officials and citizens of the Town of Red Cliff on March 7, 1994;
- 3) publishing a Notice of Intent to prepare an EIS in the *Federal Register* on March 17, 1994;
- 4) holding public meetings in Minturn, Colorado, on March 23 and 24, 1994;
- 5) distributing about 520 Forest Service newsletters on April 6, 1995;
- 6) meeting with Front Range environmental groups in Lakewood, Colorado, on April 25, 1994; and
- 7) making numerous other contacts by telephone and in person with individuals interested in the proposed project.

Since submission of the formal proposal by VA, the Forest Service has received approximately 560 letters/postcards of comment. The results of all of the above scoping efforts have been consolidated and addressed in this EIS. In addition, VA has distributed approximately 7,000 informational brochures explaining its proposal.

1.7.3.1 Significant Issues

The significant issues identified through scoping and analyzed in detail in this EIS are as follows:

- 1) the potential effects on lynx and its habitat;

- 2) the need for more reliable skiing conditions throughout the ski season and during periods when the Back Bowls are unavailable due to adverse visibility or snow conditions;
- 3) the amount of available intermediate level ski terrain at Vail Ski Area compared to skier preference;
- 4) the potential impacts on biodiversity on a landscape scale, including species diversity, habitat connectivity, structural diversity, old-growth forests, and rare or special habitats; and
- 5) the change in the character of the CAT III area from a roadless area to one developed for alpine skiing.

1.7.3.2 Other Issues

Many other topics, concerns, and viewpoints were identified during scoping. Those that relate to specific concerns about the impacts to the biological, physical, or human environment are "issues" in the NEPA process and are summarized in Table 1.1. Concerns about the technical feasibility of the proposal, the NEPA process, or about suggested alternatives are valid questions but are not "issues." Regardless of their status, issues and questions raised during scoping are addressed in an appropriate section of this EIS.

Table 1.1. Summary of other issues and concerns identified during scoping.	
VEGETATION	<ul style="list-style-type: none"> ◆ Introduction of non-native plants through revegetation ◆ Threatened, Endangered, or sensitive plant species ◆ Potential incompatibility with grazing allotments
TIMBER RESOURCES	<ul style="list-style-type: none"> ◆ Level of utilization of forest products ◆ Impacts on wildlife and other resources associated with logging roads/haul routes
WILDLIFE	<ul style="list-style-type: none"> ◆ Elk calving, migration, and summer use ◆ Small mammals and associated predators ◆ Special interest species, such as mountain lion and black bear ◆ Wildlife species that depend on interior forest habitats
AQUATIC RESOURCES	<ul style="list-style-type: none"> ◆ Aquatic life, including trout populations
WATER RESOURCES AND WETLANDS	<ul style="list-style-type: none"> ◆ Potential impacts to waters of the United States, including wetlands, riparian areas, and streams ◆ Water quality, quantity, chemistry, temperature, timing of flow, and stream channel stability
SOILS AND GEOLOGY	<ul style="list-style-type: none"> ◆ Soil erosion and revegetation ◆ Geologic hazards
AIR QUALITY	<ul style="list-style-type: none"> ◆ Air quality, both in the immediate area and in adjacent Wildernesses
VISUAL RESOURCES	<ul style="list-style-type: none"> ◆ Potential visual impacts as seen from the top of Vail Mountain, Two Elk Trail, and Commando Run Trail
HERITAGE RESOURCES	<ul style="list-style-type: none"> ◆ Cultural (heritage) resources
RECREATION	<ul style="list-style-type: none"> ◆ User experiences on the Two Elk National Recreation Trail and Commando Run Trail ◆ Opportunities for semi-primitive, non-motorized recreation ◆ Access and opportunities for big game hunting

ALPINE SKIING

- ◆ General quality of skiing at Vail Ski Area, including skier densities at key locations on the front side of the ski area
- ◆ Public benefits in terms of increased numbers of visitors enjoying public lands and returns to the U.S. Treasury
- ◆ Out-of-area skiing and potential hazards

PARKING AND TRANSPORTATION

- ◆ Available parking in the TOV
- ◆ Traffic levels and patterns on roads, streets, and highways
- ◆ Mass transportation systems

SOCIOECONOMICS

- ◆ Demand for community services such as housing, sewage, water, health care, welfare, landfills, police and fire protection, emergency medical services, schools, etc.
- ◆ Lifestyles and the Quality of life in the Vail Valley

1.8 LIST OF PERMITS AND APPROVALS

This EIS is designed to serve as an analysis document for parallel processes at several levels of government. The Forest Service decision (ROD) would apply only to NFS lands analyzed in the EIS. However, potential effects resulting from implementation of the Proposed Action on lands and activities administered by other federal, state, and local jurisdictions are also disclosed in this EIS. The ACOE is a special case in that it is a cooperating agency. As such, the ACOE has been involved early in the process to make certain that the surveys, analyses, and descriptions (delineation) of wetlands found in this EIS are sufficient for its use in the decision it makes regarding the issuance of a Department of Army (DOA) 404 permit. The information regarding waters of the United States and wetlands found in this EIS will be incorporated into the 404 (b)(1) Guidelines Alternatives Analysis, 404 Permit Application, and Public Notice (three separate documents), either partially or in total, through reference when VA applies for a 404 permit.

Decisions by other jurisdictions to issue or not issue approvals related to this proposal may be aided by the analyses presented in this EIS. Table 1.2 identifies agencies and permits or approvals that may be required to implement the Proposed Action or an action alternative. This list is not exhaustive. Other permits and approvals may be required, depending on what specific development is authorized and on the regulatory processes in effect at the time of construction. While the Forest Service assumes no responsibility for enforcing laws, regulations, or ordinances under the jurisdiction of other governmental agencies, Forest Service Special Use regulations require that permittees abide by applicable laws and conditions imposed by other jurisdictions.

Table 1.2. Permits, approvals, and consultations that may be required for CAT III area development		
Agency	Type of Action	Description of Permit or Action
FEDERAL		
Forest Service	MDP Amendment	Following issuance of a ROD, Vail Ski Area's MDP will be amended accordingly.
	Construction Plan Review	Construction Plans will be reviewed for consistency with Operating Plan standards and with the terms of the ROD. Following this review, construction may proceed with no further reviews or approvals.
Army Corps of Engineers	DOA 404 Permit	Permit required for the discharge of dredged or fill materials into waters of the United States, including wetlands.
Environmental Protection Agency	<p>Clean Air Act, as amended, 42 U.S.C.A. Section 7410-762 (PL 95-604, PL 95-95)</p> <p>Federal Water Pollution Control Act, as amended by the Clean Water Act, 33 U.S.C.A. Section 1251-1376 (PL 92-500, PL 95-217)</p> <p>Safe Drinking Water Act, 452 U.S.C.A. Section 300F-300J-10 (PL 93-523)</p>	Under NEPA, the EPA is required to review and comment on major federal actions that have a significant impact on the human environment. The EPA's responsibility and role is to provide scoping comments, review EISs, and provide information and appropriate technical assistance during and following the environmental analysis process. Specific environmental legislation for which the EPA is responsible and that would be applicable to the proposal is shown at left. Administrative and enforcement responsibilities have been delegated to the State of Colorado for all three acts. EPA's regulations currently govern who must apply for a stormwater permit in Colorado.
Fish and Wildlife Service	Section 7 Consultation and Biological Opinion	Protection of threatened and endangered species under the Endangered Species Act.
	DOA 404 Permit Consultation	Consultation under the Fish and Wildlife Coordination Act.
STATE OF COLORADO		
Department of Health	<p>Air Pollution Control Division</p> <ul style="list-style-type: none"> - Air Emissions Permit (CRS 24-7-112) 	<p>Ensures that air quality standards are not exceeded.</p> <p>Required for stationary pollution sources.</p> <p>Reviews and permits open burning proposals.</p>
	<p>Water Quality Control Division</p> <ul style="list-style-type: none"> - Colorado Pollution Discharge Elimination System Permit (CRS 244-8-501) 	Required for any point source discharges, including treatment facilities.

Agency	Type of Action	Description of Permit or Action
Department of Health (cont)	<ul style="list-style-type: none"> - Section 401 certification (CRS 25-8-302) - CDPS Construction General Permit 	<p>Must be obtained in conjunction with DOA permit.</p> <p>Approval of a Stormwater Management Plan for any stormwater discharges associated with construction activity.</p>
Department of Natural Resources	<p>Division of Wildlife</p> <ul style="list-style-type: none"> - NEPA Participation - DOA Permit Participation <p>Colorado Geologic Survey</p> <p>Colorado Natural Areas Office</p> <p>Water Conservation Board</p> <p>Division of Water Resources</p>	<p>Responsible for protection and management of state wildlife and fish resources. Participation in the Section 404 process and review of the EIS.</p> <p>Responsible for identification of geologic hazards.</p> <p>Provides reviews concerning threatened and endangered plants, including threatened and endangered habitat for plants, animals, aquatic systems, sensitive ecosystems, and other natural features.</p> <p>Responsible for providing floodplain information and analysis of water supply for mitigation of flood hazards. Also responsible for maintenance of minimum streamflow.</p> <p>Responsible for determining adequate water supply and cumulative impacts on water supply.</p>
State Historic Preservation Officer	Consult on Section 106 compliance process	Protection of cultural resources.
EAGLE COUNTY		
County Commissioners	Amendment to existing 1041 Permit	Responsible for building permit approvals, health and safety, code enforcement, etc. on federal lands and zoning and subdivision approvals on non-federal lands.

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CHAPTER 2.0 THE PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action and three alternatives to it, including the No Action or status quo alternative. It also summarizes the environmental and socioeconomic consequences of each of these four alternatives that were considered in detail. Additionally, other potential alternatives are discussed that, although considered, were not studied in detail in this EIS. Together, these alternatives represent a range of site-specific development plans for the CAT III area that were formulated in accordance with the Council on Environmental Quality (CEQ) regulations. This range of alternatives is designed to offer the public a well-defined picture of the issues and the decision maker a clear basis for choice (40 CFR 1502.14).

2.1 INTRODUCTION

The alternatives section is a critical part of an EIS in that it must: 1) rigorously explore and evaluate all reasonable alternatives, 2) display the comparative merits of each alternative, 3) identify a preferred alternative if one exists, and 4) address mitigation measures that are not included in the alternatives (40 CFR 1502.14). NEPA requires that all reasonable alternatives be considered to ensure that proposed actions are well-conceived and thoroughly evaluated.

As defined, reasonable alternatives include those that are technically and economically practical and feasible. The decision maker has the latitude to choose, modify, or combine elements of alternatives. The CEQ and federal courts have stipulated that agencies consider the objectives of a project proponent in determining the alternatives to be studied. For example, the CEQ instructs agencies to consider "the applicant's purposes and needs and the common sense realities of the situation in the development of alternatives" (Guidance Regarding NEPA Regulations, 48 Federal Register July 28, 1983).

2.2 FORMULATION OF ALTERNATIVES (SCREENING CRITERIA)

In this EIS alternatives to the Proposed Action were developed to respond to the significant issues identified during scoping and to address the purpose and need for action. As noted in Chapter 1, the significant issues include:

- ◆ the potential effects on lynx and its habitat;
- ◆ the need for more reliable skiing conditions during early portions of the ski season and during periods when the Back Bowls are unavailable due to adverse visibility or snow conditions;
- ◆ the potential impacts on biodiversity on a landscape scale, including species diversity, habitat connectivity, structural diversity, old-growth, and rare or special habitats;
- ◆ the availability of terrain for intermediate skiers at Vail Ski Area compared to skier preferences; and

- ◆ the change in character of the CAT III area from a roadless area to one developed for alpine skiing.

These significant issues, as well as planning and policy guidelines, contributed to the formulation of the screening criteria listed below.

2.2.1 SCREENING CRITERIA FOR ALTERNATIVES

The following criteria were used to establish a threshold for developing potential action alternatives to meet both the purpose and need for the Proposed Action as well as Forest Service policy and direction.

- 1) The alternative must be consistent with the Rocky Mountain Regional Guide, the land allocation decision in the White River Forest Plan, and the 1986 DN (USDA-FS 1986a).
- 2) The alternative must offer appreciably more high-quality downhill skiing opportunities for visitors to the Vail Ski Area.
- 3) The alternative must potentially provide more reliable skiing at Vail Ski Area during the early portions of the ski season without additional snowmaking.
- 4) The alternative must address other needs at the Vail Ski Area including:
 - a) providing appreciably more intermediate ski terrain,
 - b) improving the overall distribution of skiers during peak periods, and
 - c) compensating for the loss of skiable terrain when use of the Back Bowls is limited because of poor visibility and snow conditions.
- 5) The alternative must be feasible from a technical and economic standpoint while remaining environmentally responsible.
- 6) The alternative must not be incompatible with the policies and regulations of other agencies and jurisdictions.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

NEPA regulations stipulate that EISs briefly discuss alternatives that have been eliminated from detailed study and indicate the reasons for elimination (40 CFR 1502.14[a]). The four alternatives described below were considered but eliminated from detailed study.

2.3.1 DEVELOPMENT OUTSIDE OF THE CAT III AREA

2.3.1.1 Description of the Alternative

This potential alternative was sometimes referred to during scoping as the "Conservation Biology Alternative." Two groups (the Colorado Mountain Club and the Colorado Environmental Coalition) requested that this alternative be studied in detail and expressed the opinion that the CAT III area should not be developed in order to preserve its ecological values. They requested that consideration be given to more complete utilization of portions of the ski area that are already developed. In particular they asked that this alternative include:

- 1) constructing ski trails or lifts to provide additional skiing in Lower Tea Cup, Mongolia, Mushroom, Game Creek, Sheer Terror, and Northwest bowls, and the Golden Peak and Lift 4 areas;
- 2) transporting skiers to nearby resorts during peak periods;
- 3) curtailing lift ticket sales during peak days;
- 4) changing the management area prescription of the CAT III area from 1B - Winter Sports to one that would preclude any development; and
- 5) removing of the CAT III area from VA's SUP.

2.3.1.2 Reasons for Elimination (Screening Criteria: 2,3,4 [Section 2.2])

This alternative was not considered in detail for the reasons listed below. The acreages cited below and in Table 2.1 summarize all of the known ski trail development opportunities at Vail Ski Area located north of Two Elk Creek.

- 1) The most optimistic estimate of skiable terrain that could be made available under this alternative (232 acres) represents about half of the terrain that would result from the most limited of the development alternatives, Center Ridge (565 acres).
- 2) This alternative would not add sufficient intermediate level terrain at Vail Ski Area. Currently, available intermediate terrain at Vail Ski Area is insufficient to match skier preferences. The total of all intermediate and intermediate/advanced terrain that could be added through this alternative is approximately 60 acres.
- 3) This alternative would not increase the availability of dependable early season skiing conditions at Vail Ski Area. In this portion of Colorado, high-elevation, north-facing slopes provide the most consistent and reliable skiing conditions without snowmaking. This alternative would add only 61 acres of terrain with these characteristics.
- 4) Approximately 130 acres of the trail opportunities on the front side of the ski area were approved through a previous environmental review and are not within the scope of this EIS.

Table 2.1. Potential ski trail development at Vail Ski Area, north of Two Elk Creek.					
<i>General Area</i>	<i>Elevation (Feet)</i>	<i>Aspect</i>	<i>Ability Level</i>	<i>Trail Type</i>	<i>Potential Added Acreage</i>
1. Lift 4	10,200-11,200	NW	Advanced	Gladed	5.4
2. Lift 6*	9,200-9,800	W	Intermediate/ Advanced	Conventional	18.0
3. Lift 7	9,800-10,600	NW	Intermediate	Conventional/ Gladed	17.0
4. Lift 10*	9,400-11,000	N	Advanced/ Expert	Conventional	40.9
5. Lift 14	10,800-11,200	N	Intermediate	Conventional/ Gladed	11.5
6. Lift 16	9,400-10,000	N	Advanced	Conventional	8.8
7. Lift 22*	10,200-11,600	SW	Advanced	Naturally Open	Already open to skiing
8. Sheer Terror*	9,000-10,600	N	Expert	Conventional	32.8
9. Mushroom Bowl *	9,600-11,000	N	Beginner	Conventional	38.4
10. Miscellaneous Trail Widening	Variable	Variable	Variable	Conventional	20.0
11. Tea Cup Bowl**	9,600-10,000	SE	Advanced	Conventional/ Gladed	25.6
12. Lower Lift 5***	9,000-9,400	SW	Intermediate/ Advanced	Conventional/ Gladed	14.0
TOTAL POTENTIAL ADDED ACRES					232.4
* Approved via the 1986 EA/DN/FONSI. Environmental review required upon receipt of construction plans.					
** Included in all action alternatives, though a part of CAT II.					
*** Part of the CAT III area, though on the north side of Two Elk Creek. Not a part of the Proposed Action.					

- 5) This alternative would not offer adequate replacement skier capacity during times when the Back Bowls are closed or use is limited. The Back Bowls represent about two-thirds of Vail Ski Area's total skiable terrain and are sometimes an undependable resource early and late in the season, and during periods of poor weather, visibility, and snow conditions.
- 6) Mongolia Bowl is already open for lift-served skiing, and it is as vulnerable to all of the same limitations as the existing Back Bowls.
- 7) Lower Tea Cup Bowl and the lower Lift 5 area are at relatively low elevations and face primarily south and west, making them unskiable during periods of low snow.
- 8) The following off-site elements of this alternative involve systems that are already in place or would not address the need for the Proposed Action:

- a) a voluntary mass transportation system already operates between the Vail and Beaver Creek ski areas, and lift tickets are interchangeable between the two resorts;
 - b) the Agreement (Appendix A) provides a framework and commitment to undertake cooperative improvements to the mass transportation system;
 - c) a limit on daily lift ticket sales during peak periods and a monitoring system have been agreed to as elements of the Agreement;
 - d) most destination ski areas in Colorado tend to operate near or at capacity during the same peak periods throughout the ski season; and
 - e) neither limiting lift ticket sales nor busing skiers to nearby resorts addresses the need for more dependable and reliable skiing opportunities at Vail Ski Area.
- 9) The environmental consequences of continued management of the CAT III area for semi-primitive, non-motorized recreation and natural processes is already disclosed in the No Action Alternative and is thus available for selection by the Responsible Official.
- 10) The elements of this alternative do not individually or in aggregate substantively address the purpose and need for the Proposed Action.

2.3.2 TEA CUP BOWL

2.3.2.1 Description

During scoping a number of individuals requested consideration of an alternative that would allow for development of facilities only in Tea Cup Bowl. This alternative is included as a part of the potential alternative identified in Development Outside of the CAT III Area above. Further, the development of facilities in Tea Cup Bowl is an element of all action alternatives.

As a stand-alone option, this alternative would involve construction of 25.6 acres of ski trails and installation of a ski lift from the bottom of Two Elk Creek extending to the ridge of Vail Mountain, near the top of Lift 17. Two skiway/roads—one extending from Sleepytime Road to Two Elk Creek and the other running along Two Elk Creek and connecting the base of Lift 21 and China Bowl with the Tea Cup Lift base—would also be built.

2.3.2.2 Reasons for Elimination (Screening Criteria 2,3,4 [Section 2.2])

As previously discussed, this alternative would provide only 25.6 acres of additional ski trails and would serve primarily advanced skiers. With its southern exposure and relatively low elevation, the snow conditions offered in Tea Cup Bowl would likely be at least as unreliable as the Back Bowls.

2.3.3 SNOWCAT SKIING

2.3.3.1 Description

This alternative would allow only snowcat skiing in the CAT III area, primarily using natural clearings to provide snowcat and skier access, although some tree clearing for runs, snowcat travelways, and other facilities might be required. From six to ten skiers would be transported in a snowcat to the top of the mountain or wherever terrain,

vegetation, and other conditions would allow. Skiers would then descend the mountain, be picked up at the bottom, and returned to the top. The cost for this type of skiing often ranges from \$150 to \$200 per day. The attraction of snowcat skiing is highest when untracked snow is available. Tracked or skied-on snow is less attractive, and potential customers generally choose to ski groomed runs on days when fresh powder is not available.

2.3.3.2 Reasons for Elimination (Screening Criteria 3,4,5)

Currently, VA is approved to operate snowcat tours in the CAT III area on a non-commercial basis from January through March and has done so since the winter of 1992-93. This type of opportunity is generally viable only for limited numbers of skiers under untracked, powder snow conditions. Commercial snowcat operations normally require large expanses of skiable terrain to satisfy this relatively small number of customers. With several snowcats in operation, it is likely that all skiable terrain in the CAT III area would be tracked soon following a storm. Snowcat skiing would not offer a viable substitute for the terrain capabilities of the Back Bowls because of its limited potential to support enough skiers on either a daily or season-long basis. Snowcat tours are provided in the general vicinity of the ski area by Vail Snow Tours and Chicago Ridge Snow Tours. Based on unused service days, demand for these services appears to be met.

2.3.4 DEVELOPMENT OUTSIDE OF THE SUP AREA

2.3.4.1 Description

This alternative would involve developing terrain outside of VA's SUP boundary instead of developing the CAT III area. The lands above East Vail on the ridge separating Mill Creek and Gore Creek as well as the Game Creek area west of the existing ski area were specifically mentioned during scoping. This alternative could include lands well removed from Vail Ski Area.

2.3.4.2 Reasons for Elimination (Screening Criteria: 1,2,3,5,6)

The slopes above East Vail are on steep, glacially scoured mountain side slopes. Large areas of rock outcrop and cliffs would severely limit available ski terrain and present substantial engineering challenges. Nearly all of the available terrain that could be opened would be for expert skiers. Ski development in this area would also require a separate base area. With Gore Creek nearby, a new portal in East Vail would likely significantly affect wetlands and nearby residential areas. Game Creek is adjacent to the western portion of the SUP boundary. The potential for development in this area was previously evaluated and rejected (USDA-FS 1986b). In the earlier analysis, development in both South and Main Game Creek with a Minturn portal was considered. These sites were eliminated from consideration on the basis of concerns for critical elk habitat and engineering difficulties. Also, these areas are allocated to management emphasizing winter range for wildlife and semi-primitive, non-motorized recreation in the 1984 Forest Plan .

The Forest Plan EIS (USDA-FS 1984) evaluated alternative winter sports sites across the WRNF. In Eagle County this involved examination of eight potential new winter sports sites and expansions to both the Vail (the CAT III area) and Beaver Creek ski areas. Through the Forest Plan process, only the expansions to the Vail and Beaver Creek ski areas and the development of Adam's Rib site were allocated to management for downhill skiing. The other potential sites were eliminated from consideration for that planning period. It is not within the

scope of this EIS to revisit these analyses and decisions; instead, this EIS is tiered (40 CFR 1502.20) to the Forest Plan EIS.

2.4 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.4.1 ALTERNATIVE A: NO ACTION (FIGURE 2.1)

CEQ regulations require that agencies consider the No Action (status quo) Alternative in making decisions that affect the environment. This alternative establishes the benchmark against which the potential impacts of action alternatives should be compared. It is also a viable option for the decision maker. In selecting the No Action Alternative in a ROD, the decision maker has the discretion to define conditions or terms of its implementation. As noted in the previous section, all alternatives, including the No Action Alternative, could involve modification of the SUP for the area and require an amendment to the Forest Plan to emphasize values other than downhill skiing.

The No Action Alternative in this EIS assumes that no development, ski area-related or otherwise, would occur in the CAT III area. Instead, the area would continue to offer semi-primitive, non-motorized recreation opportunities. As well, no vegetation management activities, such as timber harvest, might occur. Over the long term, vegetation would be affected primarily by natural forces. Livestock grazing would continue at its current level, and the existing patterns and trends in dispersed recreation use would continue.

Outside the CAT III area all alternatives, including the No Action Alternative, assume that previously analyzed and approved actions will eventually be implemented. Table 2.1 (see Development Outside of the CAT III Area above) identifies approximately 130 acres of previously approved trail development opportunities within the CAT I portion of the ski area. A number of lift installations and upgrades on the front side and elsewhere are anticipated due to previous approvals. They include:

- ◆ Lift 22 (Mongolia Bowl)
- ◆ Lift 6 (Golden Peak)
- ◆ Lift 10 (Northeast Bowl)
- ◆ Sheer Terror Lift
- ◆ Lionshead Gondola (Lift #19)
- ◆ Lift 9 (Eagle's Nest)
- ◆ Mushroom Bowl Lift

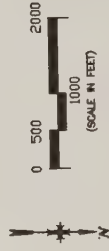
Consistent with Forest Service policy, the construction plans for these projects would be reviewed for any significant new circumstances or changed conditions before implementation would be allowed. A finding of changed circumstances could necessitate further formal NEPA review. While this EIS includes an evaluation of these previously approved developments as cumulative effects, it is not within its scope to revisit these decisions. Figure 2.1 (below) and MAP 1 depict the elements of this alternative.

Other existing facilities would also be renovated and expanded under this alternative. For example, the Eagle's Nest Gondola terminal and restaurant and Mid-Vail Restaurant could be remodeled and enlarged under the No Action Alternative. Both the lift improvements and restaurant expansions would require additional employees for operation.

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No Action
Alternative

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Note:
Due to scale of map, ski facility locations are
representative and not in their exact locations.

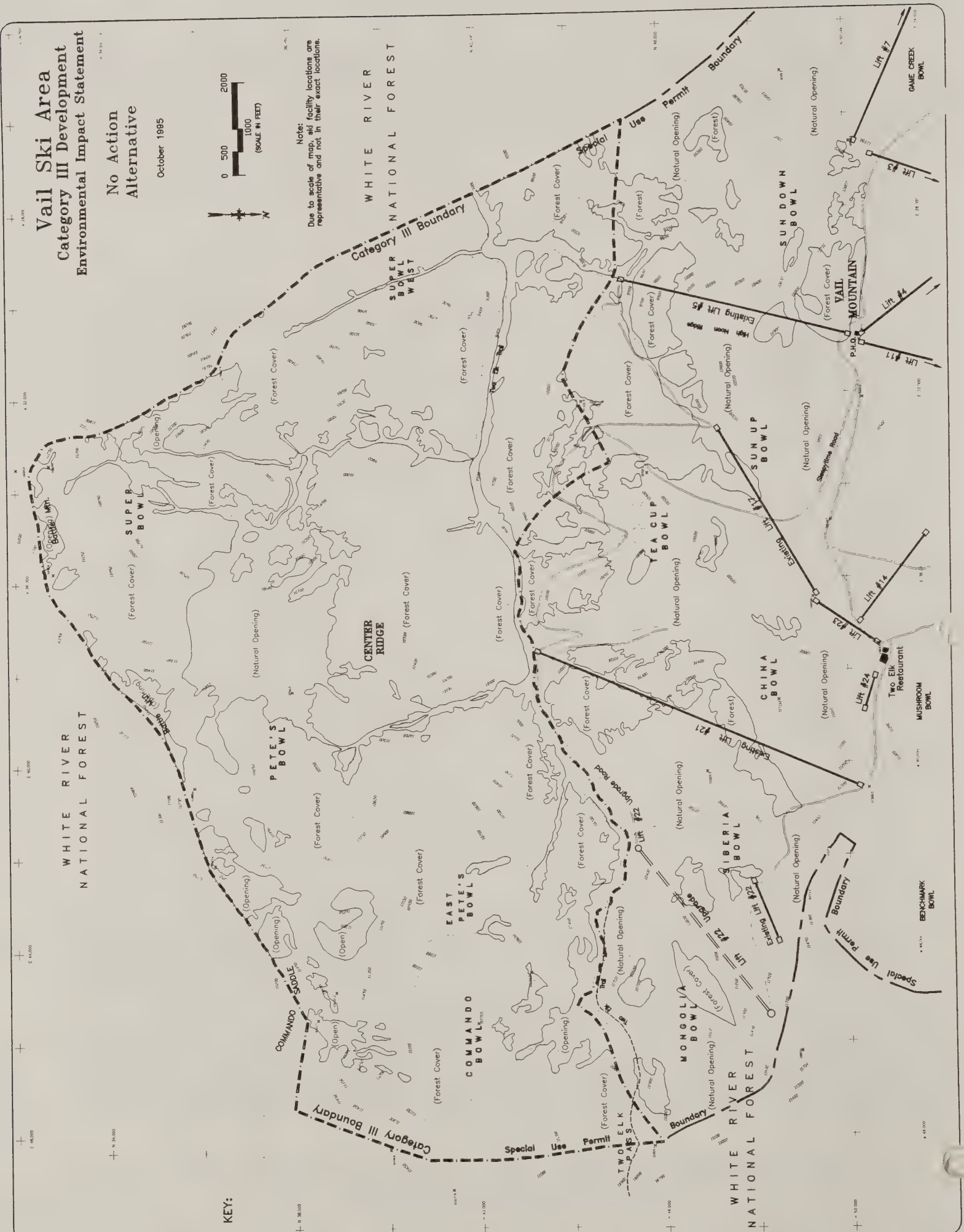


Figure 2.1. Depiction of elements associated with Alternative A: No Action Alternative.

Maintenance and annual operations in the CAT I and II portions of the ski area would continue under the No Action Alternative. This involves operation of downhill skiing facilities as well as the current offering of summer recreation programs such as biking and hiking. It also includes activities such as regrading roads, maintaining bike and pedestrian trails, maintaining lifts, installing signs, and cleaning and maintaining water bars, culverts, and other facilities under normal operating procedures. This alternative also assumes that the seasonal wildlife closure in China Bowl will continue.

Finally, the No Action Alternative would assume that the general pattern of rapid residential and commercial growth and development in the Vail Valley would continue. See the Socioeconomic sections of chapters 3 and 4 for a more detailed discussion of growth and development in Vail Valley.

2.4.2 ELEMENTS COMMON TO ACTION ALTERNATIVES

Outlined below are general descriptions of the major elements of each action alternative. Prior to implementation, detailed construction plans would be submitted and reviewed by the Forest Service. All facilities would be required to meet Forest Service design standards, including those listed in the Summer Construction and Operating Plan and other Best Management Practices (BMP). Figures 2.2 to 2.4 depict the locations of many of these proposed features.

2.4.2.1 Tea Cup Bowl Facilities

A ski lift, several trails, and one skiway/road for Tea Cup Bowl are elements of all action alternatives. A large portion of upper Tea Cup Bowl is already open to skiing. The proposed lift would allow use of the entire Tea Cup Bowl and West Wall of China Bowl. This lift would also provide access to the CAT III area and provide critical backup lift service from Tea Cup, China, Mongolia, and Siberia bowls and the CAT III area.

2.4.2.2 Restaurant

Under the Proposed Action and the MDP Alternative, a 20,000-square-foot restaurant, seating 300 to 400 people would be constructed near the confluence of Pete's Bowl and Two Elk Creek. It would compare in size to the Spruce Saddle Restaurant at the Beaver Creek Ski Area. The restaurant would operate only during the ski season and would provide service for skiers using the CAT III area as well as China, Tea Cup, Siberia, and Mongolia bowls. A restaurant is not part of Alternative B.

2.4.2.3 Picnic Decks

Picnic decks are permanent wooden platforms about 5,000 square feet, that would be located in either Pete's Bowl or Super Bowl, or both, depending on the alternative. The decks would serve as a platform along which a portable "picnic sled" could be positioned to provide food and beverage service for skiers. Attached to each deck would be a 2,000-square-foot warming hut and self-contained restroom facility.

2.4.2.4 Ski Patrol and Public Facilities

Under all action alternatives structures would be required for ski patrol personnel and equipment. One ski patrol facility would be required under the Center Ridge Alternative, while two would be necessary under the Proposed

Action or the MDP Alternative. Public facilities would include a warming hut and small self-contained restrooms collocated with, but separate from, the ski patrol facility near the upper lift terminals.

2.4.2.5 Bridges Crossing Two Elk Creek

Two bridges crossing Two Elk Creek are common to all action alternatives. Depending on the alternative, one or two additional bridges crossing Two Elk Creek would also be required. Generally, these bridges would be about 30 feet wide and about 60 feet long. In most cases, bridge abutments and supports would be built on the banks above and away from the stream channel. Due to its length, a bridge near the base terminal of Lift 21 would likely require a pier support at its midpoint. This bridge would provide skier access from China Bowl to the Intertie Skiway/Road and the CAT III area. Unlike the other bridges, this structure would be about 160 feet long. The second bridge common to all action alternatives would cross Two Elk Creek at the base terminals of the Ridge and Tea Cup lifts. This bridge would accommodate much of the construction phase traffic, and would be a crossing for skiers departing the CAT III area at the end of the day.

2.4.2.6 Super Bowl Skiway/Road Bridge

A bridge spanning a channel on a tributary of Two Elk Creek in order to avoid impacts to a narrow wetland and riparian area along the Super Bowl Skiway/Road would be required under all action alternatives.

2.4.2.7 Ski Lifts

A system of lifts to provide skier access would be included in all action alternatives. The lift alignments depicted for each alternative (Figures 2.2 through 2.4) represent a zone of disturbance that would require clearing of vegetation and installation of lift towers. This configuration could allow for lifts of varying capacities over time. Initially, lower capacity lifts such as surface or fixed-grip lifts, could be built on a given alignment; then, as skier distribution and usage patterns became more apparent, they could be replaced with lifts of greater capacity. All proposed lift alignments would require a minimum clearing of trees of 50 to 90 feet. Other than to install tower footings, excavation would not usually be required for lift lines. The towers would be installed primarily using helicopters, while the upper and lower terminals would be constructed using conventional heavy equipment. Terminal placements could each require clearing or grading of up to 0.75 acres per terminal. In all cases, the location of specific tower sites would be adjusted during the actual construction survey to avoid or minimize impacts to wetlands, unsuitable or unstable slopes, or other sensitive areas.

2.4.2.8 Skiway/Roads

Under the action alternatives, developed skiway/roads would be needed for construction and maintenance of lifts, trails, and other facilities and to provide for skier circulation between key locations within the CAT III area. These routes would require clearing vegetation 60 feet wide with a 12-foot wide running surface and would typically provide a 30-foot skiing surface. In cases where cross-slopes are less than 10 percent, grading would probably be unnecessary. Generally, skiway/roads would be out-sloped to minimize the need for culverts and would be constructed at a 7 to 11 percent grade to allow for skier circulation. Skiway/roads would be revegetated according to Forest Service standards and requirements. All skiway/road routes would be skiable. Some routes would be needed for travel and hauling during initial construction and would then be used in subsequent years only as skiways. Other routes would occasionally be used for maintenance and monitoring during the summer. The Intertie, Tea Cup, and Super Bowl skiway/roads would be necessary components of all action alternatives.

2.4.2.9 Ski Trails

Several classes or types of ski trails would be constructed to form each ski pod. Some conventional (graded) trails would be constructed in each pod under each alternative. *Conventional* trails would be cleared of vegetation to a width of 100 to 300 feet in order to produce a smooth ground surface that would allow grooming in low snow conditions. The amount of grading would vary depending on the natural condition of the existing slope, but would be substantial. All conventional trails would be revegetated according to the prescribed standards and requirements of the Forest Service. Removing stumps, while having less impact on soils than grading, would still expose soils temporarily. Consequently, the environmental analysis in this EIS treats stump removal at the same degree of disturbance as graded trails. *Glading* is another type of trail development and requires selective cutting, or thinning, of up to one-third of the existing trees. Generally, no grading would be required, but some selective stump removal or flush-cutting of stumps may be necessary to allow skiing. The width of gladed trails would vary according to design and the density of natural vegetation but would also generally range from about 100 to 300 feet. Glading is best suited to areas with widely spaced trees. Finally, much of the CAT III area has terrain that is *naturally open* and is therefore suitable and usable for skiing with little or no disturbance to vegetation or soils.

2.4.2.10 Utilities

Under all action alternatives, the utilities for lifts, the restaurant, and other facilities would be extended to and within the CAT III area via lines buried within existing or proposed ski facilities (graded roads or skiways or ski trails). The Proposed Action and the MDP Alternative would require extension of water and sewer lines from the Vail Mountain ridge line near Two Elk restaurant to the proposed restaurant in the CAT III area. These lines would be buried in a proposed 40-foot utility corridor that would run through a partially disturbed area in China Bowl. Other than to service the restaurant, water and sewer lines would not be extended into the CAT III area. Sewage would be pumped back into the TOV sewage treatment system. Potential impacts associated with utility lines are integrated into the analyses for each appropriate discipline, rather than addressed separately. The proposed utility corridor from the summit of Vail Mountain into the CAT III area is depicted on Figure 2.3 below.

2.4.2.11 Construction and Phasing

If approved, construction could begin as early as the summer of 1996 at the discretion of VA, based on the conditions of the ROD. Depending on the alternative, construction could span five or more years and would be phased so that potential impacts could be controlled, minimized, and monitored. Construction at an individual site might span several years; however, erosion and sediment control, and revegetation would be required each season. Buildings would generally be completed within the year they were started, except that concrete foundations might be installed one season and construction completed the next. Inspection and monitoring would continue beyond completion of construction. In most cases, construction would involve heavy equipment such as trucks, dozers, and backhoes. However, lift towers would be installed using helicopters. All activities would be consistent with the Forest Service requirements and the BMP specified in VA's approved Summer Construction Plans.

2.4.2.12 Timber Removal and Disposal

Under all action alternatives, timber would be cut from lift alignments, building sites, runs, trails, skiways, and roads. Timber removal associated with the project would be handled in accordance with Forest Service policy.

Due to the potentially large volume of timber made available through development of the CAT III area, this EIS evaluates different methods of timber harvest and two possible haul routes from the CAT III area for each action alternative as described below.

2.4.2.12.1 Harvest Methods

Method 1: Under this method, none of the timber cleared for ski trails, lift lines, roads, and other facilities would be removed from the area. Instead, merchantable timber, non-merchantable material, and slash would be piled and burned when weather and wildfire conditions allow. This is common practice at Vail Ski Area in ski trail construction projects and is conducted under provisions of VA's Summer Operating Plan with the Forest Service and an Open Burning Permit obtained from the Colorado Department of Public Health. Even though none of the timber would be utilized, VA would be required to pay for all timber meeting the conditions identified in Method 2 below. Logging equipment would generally involve use of rubber-tired skidders.

Method 2: This harvest method would involve commercial utilization of merchantable timber located within about 1,000 feet of roads and skiways developed in the CAT III area. Retrieval would be limited to slopes less than 40 percent. VA would be required to pay for all merchantable timber accessed under these conditions. Non-merchantable material would be available to VA on a free-use basis. Logs would be skidded to roadside landings for loading using rubber-tired skidders.

Method 3: Method 3 considers harvest techniques that are seldom used in Colorado in order to maximize commercial utilization of the timber cleared for the CAT III area developments. These techniques include skyline (cable) and helicopter yarding in addition to log forwarding (feller-buncher). This would allow timber cut for trails on steep slopes to be retrieved rather than skidding the logs to relatively numerous landings in roadside zones before loading on trucks. VA would be required to pay for all merchantable material removed.

2.4.2.12.2 Haul Options

Option 1: This option would involve the use of existing roads, both in the Back Bowls and on the front side of the ski area, to haul timber to I-70. The route trucks would use is shown in the Timber section in Chapter 4. Trucks hauling timber would depart the CAT III area and travel on Sleepytime Road to the top of Vail Mountain. From there, trucks would travel the main mountain road to Mid-Vail. Just below Mid-Vail, logging trucks would travel the Transmontane and Mill Creek Road routes. Entering Vail Village at Vail Road, trucks would proceed directly to I-70 and then on to a sawmill. This route could be employed under any action alternative.

Option 2: This haul route is analyzed to fully explore options for removing the timber that would be harvested under either the Proposed Action or the MDP Alternative. It would involve construction of 2.4 miles (1.1 miles in the PA) of temporary road which would link the CAT III area with the Shrine Pass/Vail Pass road system via Lime Creek. Approximately 900 feet of this proposed haul road would actually be in the CAT III area. This would be a graded road approximately 30 feet wide with a running surface of about 12 feet. The life of the road would be 3 to 5 years, depending on the length of timber activities involved with development. It would probably be used less than 4 months a year (July through early October) because of weather conditions. Public access would be controlled, and the road would be obliterated and made impassable after its use. The area between the existing Lime Creek Road and the potential road extension is described in several disciplines in Chapter 3. The impacts of this route are examined under Alternative D. However, it could also be built as part of Alternative C. The potential impacts of this road are discussed and the route is depicted in the Timber Resources section in Chapter 4.

Option 3: This option would employ helicopter transport of logs from the CAT III area to one of several locations. Logs removed from the CAT III area would be airlifted to a staging area on the Lime Creek Road, the Timber Creek Road, or Two Elk Trailhead near Minturn.

2.4.2.13 Operation of Facilities

All stipulations, provisions, and requirements regarding operation of facilities and maintenance that are now included in VA's SUP and Operating Plans would be continued under implementation of any of the alternatives, including continuation of the elk calving closure in China Bowl until July 1 each year. Summer and winter operations would generally continue at the same levels and locations within the CAT I and II areas.

2.4.2.14 SUP and Forest Plan Modifications

The selection of any of the action alternatives could involve adjustments to the SUP boundary, a change to the area management prescription, or amendment of the Forest Plan. Forest Service policy (Forest Service Manual [FSM] 2721. 61[e](6)) allows lands to remain under SUP only if: 1) they are necessary for the operation and function of the ski area; 2) they are needed for expansion in the foreseeable future; or 3) they are necessary to help protect public health and safety. The analysis contained in this EIS will allow the decision maker to modify the SUP, amend the Forest Plan, or both to emphasize resource values other than alpine skiing as necessary.

2.4.3 ALTERNATIVE B: CENTER RIDGE (FIGURE 2.2)

History and Emphasis

All of Super Bowl and a portion of Pete's Bowl were part of the original ski area's 1962 SUP. This alternative was developed to explore ways to further reduce potential impacts to wetlands and old-growth forest and to limit impacts to a smaller geographic area.

2.4.3.1 Description of Elements (See also MAP 2)

2.4.3.1.1 Lifts

Super Bowl, Ridge, and Tea Cup Bowl lifts would be built under this alternative (Figure 2.2).

2.4.3.1.2 Trails and Ski Experience

Approximately 565 acres of skiable terrain (Table 2.2, below) would be offered under this alternative. About 65 percent would be naturally open or gladed skiing. The remaining ski terrain would be conventional trails cleared through more densely forested areas. This alternative would provide about 39 acres of beginner, 500 acres of intermediate, and 27 acres of advanced-level skiable terrain. Upper Super Bowl includes a large area of naturally gladed intermediate level slopes, while the Center Ridge area would primarily offer skiing on conventional trails. This alternative facilitates access to the naturally open and gladed slopes of Super Bowl and the upper portion of Pete's Bowl.

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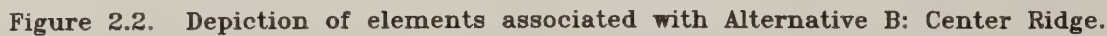


Table 2.2. Approximate acres of skiable terrain by trail type under Alternative B				
Area/Bowl	Conventional	Gladed	Natural	Total
Commando	0	0	0	0
East Pete's	0	0	0	0
Pete's	75	47	15	137
Super	94	60	235	389
Lower Super	0	0	0	0
West Super	0	0	0	0
Lower Sun Down	0	0	0	0
Lower Tea Cup	27	5	7	39
TOTAL	196	112	257	565

2.4.3.1.3 Skiway/Roads

The total length of skiway/roads under this alternative is 6.4 miles. Of this, 2.5 miles would support occasional motorized equipment use for maintenance of lifts and other facilities after construction is completed. The main skiways included in this alternative would include the Intertie Skiway/Road along Two Elk Creek and the Super Bowl Skiway/Road extending to the top of the Super Bowl Lift.

2.4.3.1.4 Bridges

Two bridges crossing Two Elk Creek and another crossing a tributary of Two Elk Creek on the Super Bowl Skiway/Road would be required.

2.4.3.1.5 Restaurants

There would be no restaurants under this alternative.

2.4.3.1.6 Picnic Decks

There would be one picnic deck under this alternative.

2.4.3.1.7 Ski Patrol and Public Warming Facilities

There would be one set of ski patrol and one set of public warming facilities under this alternative.

2.4.4 ALTERNATIVE C: PROPOSED ACTION (FIGURE 2.3)

History and Emphasis

This alternative represents a site-specific proposal submitted by VA. It was developed after consideration of several years of technical studies in the CAT III area as well as coordination among VA, the Forest Service, and

Vail Ski Area Category III Development Environmental Impact Statement

Proposed Action Alternative

October 1985



Note:
Due to scale of map, ski facility locations are
representative and not in their exact locations.

- KEY:**
- Proposed Ski Lift
 - Proposed Ski Trail
 - Proposed Skitway/Road
 - Proposed Road
 - Proposed Bridge Site

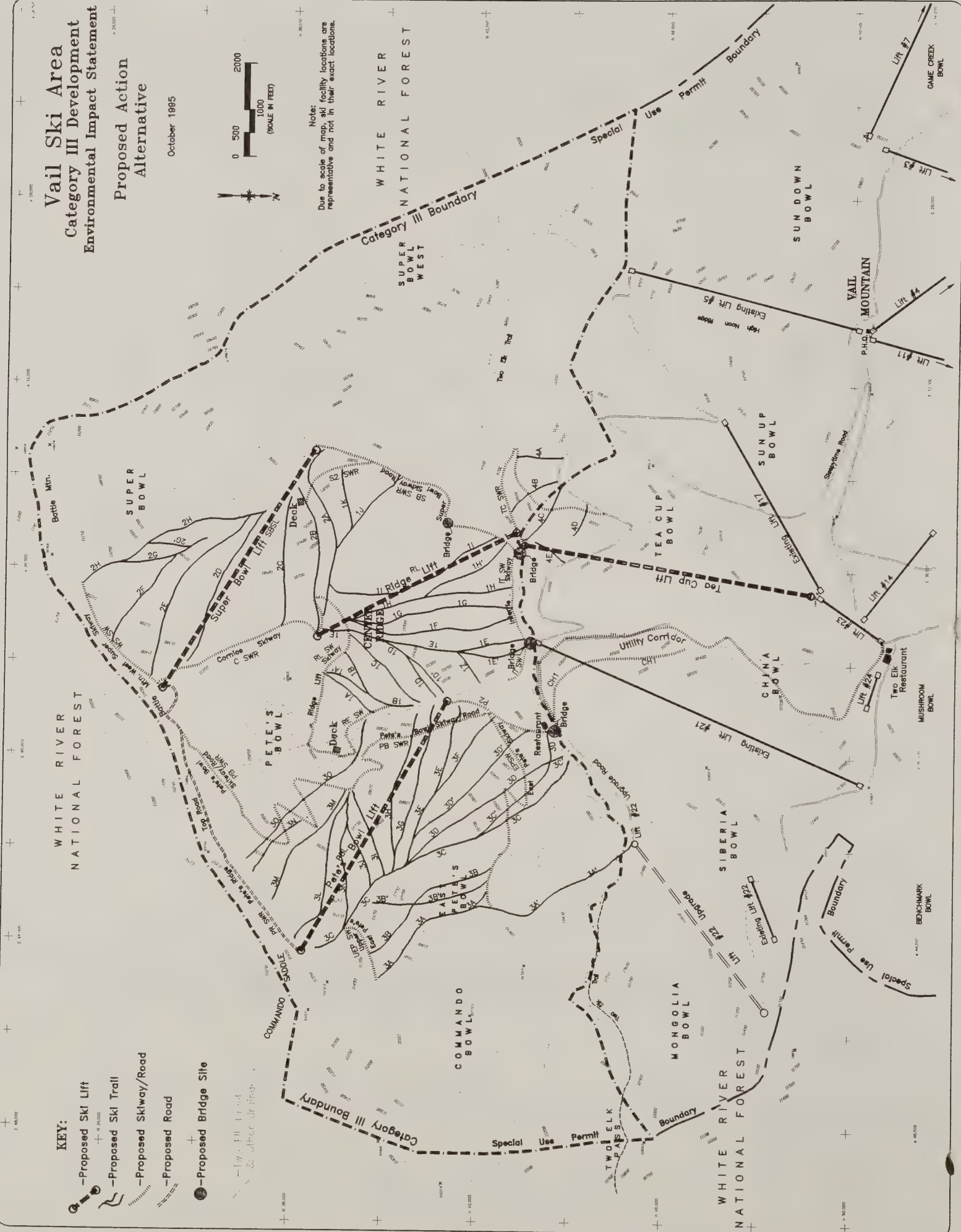


Figure 2.3. Depiction of elements associated with Alternative C: Proposed Action.

other government agencies. One of the primary objectives of this process was the evaluation of various locations for lift terminals, bridges, food service facilities, and placement of ski trails to reduce potential impacts to wetlands, old-growth forest, and important wildlife habitat.

2.4.4.1 Description of Elements (See also MAP 3)

2.4.4.1.1 Lifts

In addition to the Tea Cup Lift, three other lifts would be constructed under this alternative. These would include the Pete's Bowl, Super Bowl, and Ridge lifts.

2.4.4.1.2 Trails and Ski Experience

Approximately 917 acres of skiable terrain (Table 2.3, below) would be offered under this alternative. Of this, 74 percent would be naturally open or gladed skiing. The remaining ski terrain would be conventional trails cleared through more densely forested areas. This alternative would provide about 33 acres of beginner, 827 acres of intermediate, and 57 acres of advanced-level skiable terrain.

Table 2.3. Approximate acres of skiable terrain under Alternative C by trail type.				
Area/Bowl	Conventional	Gladed	Natural	Total
Commando	0	0	0	0
East Pete's	69	42	0	111
Pete's	173	117	103	393
Super	81	58	235	374
Lower Super	0	0	0	0
West Super	0	0	0	0
Lower Sun Down	0	0	0	0
Lower Tea Cup	27	5	7	39
TOTAL	350	222	345	917

2.4.4.1.3 Road

Pete's Ridge/Top Road would be the only road required under this alternative. It would be needed to provide construction and maintenance access for the top terminal of the Pete's Bowl Lift. It is approximately 7,100 feet long (1.1 miles) and traverses relatively gentle terrain along the ridge above Lime Creek and Pete's Bowl. A small portion of this proposed road may be skiable. Skiways would provide adequate access for construction and maintenance of the remaining facilities.

2.4.4.1.4 Skiway/Roads

The total length of skiway/roads under this alternative would be 11.1 miles. Most of these would support occasional motorized equipment use for maintenance of lifts and other facilities after construction is completed. The primary skiway/roads for this alternative include Pete's Bowl Skiway, the Intertie (along Two Elk Creek), and Super Bowl.

2.4.4.1.5 Bridges

Three bridges crossing Two Elk Creek and another crossing a tributary of Two Elk Creek on the Super Bowl Skiway/Road would be required.

2.4.4.1.6 Restaurant

There would be one restaurant under this alternative.

2.4.4.1.7 Picnic Decks

There would be two picnic decks under this alternative located in Pete's and Super bowls.

2.4.4.1.8 Ski Patrol and Public Warming Facilities

There would be two sets of ski patrol and public warming facilities under this alternative.

2.4.5 ALTERNATIVE D: MDP ALTERNATIVE (FIGURE 2.4)

History and Emphasis

This alternative most closely resembles the plan of development for the CAT III area conceptually analyzed in 1986; however, specific ski trail alignments were not developed for this previous analysis. As now defined, this alternative reflects an approach to trail development designed to provide more complete utilization of the CAT III area consistent with the 1986 lift configuration. This alternative was developed in order to examine more complete utilization of the CAT III area, and to be the most responsive within the range of alternatives in addressing the issue of loss of skiing opportunity when the Back Bowls are not available.

2.4.5.1 Description of Elements (See also MAP 4)

2.4.5.1.1 Lifts

In addition to the Tea Cup Lift, four other lifts would be constructed under this alternative. These would include the Commando Bowl, Super Bowl, Super Bowl West, and Lower Sun Down Bowl lifts. This is the only action alternative that would provide lift access into Commando Bowl, Lower Sun Down Bowl, and Super Bowl West.

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Note:
Due to scale of map, ski facility locations are
representative and not in their exact locations.

WHITE RIVER
NATIONAL FOREST

KEY:

- Proposed Ski Lift
- Proposed Ski Trail
- Proposed Skilway/Road
- Proposed Road
- Proposed Bridge Site
- 100' L.V. Crest
& other drainage
- Original U.S.F.S.
Line Creek
Road
Alignment



Figure 2.4. Depiction of elements associated with Alternative D: MDP Alternative.

2.4.5.1.2 Trails and Ski Experience

Approximately 1,294 acres of skiable terrain (Table 2.4, below) would be offered under this alternative. Of this, 56 percent would be naturally open or gladed skiing. The remaining ski terrain would be conventional trails cleared through more densely forested areas, primarily in Commando Bowl and Super Bowl West. This alternative would provide about 80 acres of beginner, 958 acres of intermediate, and 216 acres of advanced-level skiable terrain.

Table 2.4. Approximate acres of skiable terrain under Alternative D by trail type.				
Area/Bowl	Conventional	Gladed	Natural	Total
Commando	76	48	103	227
East Pete's	67	43	0	110
Pete's	199	141	0	340
Super	70	58	235	363
Lower Super	10	0	0	10
West Super	89	52	40	181
Lower Sun Down	15	9	0	24
Lower Tea Cup	27	5	7	39
TOTAL	553	356	385	1,294

2.4.5.1.3 Roads

Approximately 2.4 miles of road would be constructed under this alternative. The 1.1 miles of Pete's Ridge/Top Road described under Alternative C would be part of Alternative D as well. In addition, a 1.3-mile temporary road connection to Lime Creek would be constructed solely to facilitate commercial utilization of timber during development.

2.4.5.1.4 Skiway/Roads

The total length of skiway/roads under this alternative is 18.2 miles, approximately 60 percent of which would support occasional motorized equipment use for maintenance of lifts and other facilities after construction is completed. In addition to containing a network of skiways similar to those in other action alternatives, the MDP Alternative also includes construction of about 5 miles of skiways along the upper and lower segments of Super Bowl West.

2.4.5.1.5 Bridges

Four bridges crossing Two Elk Creek and another crossing a tributary of Two Elk Creek on the Super Bowl Skiway/Road would be required. The lower bridge location would connect skiway/ roads at the confluence of Super Bowl West and Lower Sun Down Bowl.

2.4.5.1.6 Restaurants

There would be one restaurant under this alternative.

2.4.5.1.7 Picnic Decks

There would be two picnic decks under this alternative located in Pete's and Super bowls.

2.4.5.1.8 Ski Patrol and Public Warming Facilities

There would be three sets of ski patrol and public warming facilities under this alternative.

2.5 COMPARISON IMPACT SUMMARY OF ALTERNATIVES

2.5.1 COMPARISON OF IMPACTS BY SIGNIFICANT ISSUE

Five significant issues involving the potential development of the CAT III area were identified during scoping and introduced briefly in Chapter 1 (Significant Issues). These included: 1) effects on lynx and its habitat, 2) need for reliable skiing throughout the season, 3) availability of intermediate ski terrain, 4) impacts on biodiversity; and 5) change in the character of the CAT III area from roadless to an area developed for alpine skiing. The following summaries are intended to differentiate the effects on resources among the four alternatives being considered. Additional discussion of these significant and other important issues is found under the appropriate resource sections in Chapter 4. The impacts discussed in this section and in Summary of Impacts by Important Issues (this chapter) do not include potential mitigation measures. A discussion of mitigation and a resource specific mitigation table follow in the Mitigation Measures section.

2.5.1.1 Effects on Lynx

Lynx (a federal candidate, Colorado Endangered, and White River Forest Sensitive species) have been known to exist within the LA and likely the PA, but there are no recent records of lynx in the PA within the past several years. Lynx are on the fringe of their historic range in Colorado and may never have been common because of patchy habitat and other factors. For the proposal being analyzed, the effects on lynx and its habitat primarily involve fragmenting forested habitat, direct loss of forested habitat, and changes (some adverse and some beneficial) to the habitat of its prey base. Old-growth forest is a critical resource for lynx for denning. Because of the relatively large home range size of lynx it is necessary to address impacts to habitat on the basis of at least the LA rather than just the PA. There are 697 acres of old-growth timber in the PA and 3,113 acres in the LA. In addition, there are another 2,181 acres of habitat in the LA that have most but not all, of the ecological characteristics of old growth. The amount and percent of old growth habitat that would be disturbed differs by alternative. These amounts and percentages are presented in Table 2.5. Further discussion of this issue is found in the Wildlife and Biodiversity sections of both chapters 3 and 4.

Table 2.5 Comparison of old-growth forest disturbance within the PA and LA.

Alternative	Acres Disturbed by Alternative	Percent Disturbed by Analysis Area		Acres Undisturbed by Analysis Area	
		Project Area	Landscape Area	Project Area	Landscape Area
No Action	None	None	None	697	3,113
Center Ridge	42	6%	1%	655	3,071
Proposed Action	94	13%	3%	603	3,019
MDP	177	25%	5%	520	2,936

Denning habitat is of little importance without other life requisites also being present. A key element to the survival of lynx is the quality of its foraging habitat which is directly equated to suitable habitat for its primary and preferred prey species, the snowshoe hare. Secondary prey species (i.e. red squirrels, blue grouse, southern red-backed vole, and deer mice) for the lynx are more abundant than hare in the PA, but cannot substitute for low abundance of snowshoe hare. Snowshoe hare prefer early successional forests having dense understories and greater than 2,000 stems per acre at breast height. In Colorado these forests are primarily spruce-fir, and mixed spruce-fir and lodgepole. During spring and summer hares forage on a wide variety of herbaceous vegetation. An analysis of the potential snowshoe hare habitat within the PA showed that 642 of the 1,351 acres of spruce-fir and lodgepole pine habitat have more than 2,000 stems per acre, the quantity of stems most preferred by hare. In the LA, 4,071 of the 8,137 acres of potential snowshoe hare habitat has more than 2,000 stems per acre. Thus, although suitable habitat for hare occurs within the PA and LA, only about half of it may be capable of supporting adequate densities of hare to serve as lynx foraging habitat. Fire suppression and the lack of early seral stages of forested habitat may be the main reasons for the LA not having higher hare densities.

The Biological Evaluation (BE) prepared for the Draft EIS concludes that one or more individual lynx could be adversely affected by implementing the proposed project but that the population viability would not be affected. The potential for creating an adverse impact to lynx is directly proportional to the amount of fragmentation of existing foraging habitat and the loss of old-growth forest. Conversely, some of the proposed clearing of forested habitats would create quality snowshoe hare habitat along ski trail edges thereby adding some foraging habitat for lynx.

2.5.1.2 Reliable Skiing Conditions

The south-facing Back Bowls comprise about two-thirds of the skiable terrain at Vail Ski Area. Historically, the Back Bowls have proven to be somewhat undependable, especially during early and late portions of the ski season. As well, even mid-season weather or snow conditions can periodically close the Back Bowls or at a minimum limit their use. The consequences of the Back Bowls being unavailable during a peak period represent a substantial threat to the quality of the skiing experience at Vail Ski Area. Records indicate that, due to snow conditions, the Back Bowls would not have been able to open or would have had marginal snow conditions 13 of the past 31 years. Reliability of early and late season skiing is the most important ingredient in being able to build skier visitation during off-peak periods. The high elevation, north-facing slopes of the CAT III area would hold the early snow that fell and maintain that snow pack as a good quality skiing surface. The terrain in the CAT III area would also be conducive to carrying that snow pack through the ski season. As well, the gladed skiing

offered by the CAT III area would provide the visual references necessary for skiing in adverse light and weather conditions. These same conditions can, for all practical purposes, close the Back Bowls to skiing periodically. In general, the development of the CAT III area would compensate for the periodic restricted use of the Back Bowls. The current skiable terrain included in the Back Bowls is approximately 1,612 acres. The additional terrain that could be offered under each of the alternatives that could help offset Back Bowl terrain is presented in Table 2.6 below.

Table 2.6. Comparison of additional skiable terrain by alternative (acres)			
No Action	Center Ridge	Proposed Action	MDP
232	565	917	1294

2.5.1.3 Intermediate Ski Terrain

There are currently 1,420 acres of developed intermediate ski terrain at Vail Ski Area. The availability of intermediate ski terrain is a primary focus of the Proposed Action. Reflecting a trend in national and regional markets, a growing number of Vail skiers rate themselves at the intermediate ability level. Data from 1994-95 indicate that approximately 50 percent currently fall in this category. However, only about 39 percent of Vail's trail capacity is rated intermediate in difficulty, resulting in a deficit of roughly 11 percent. The CAT III area development alternatives would not appreciably change the percentage of intermediate terrain at the resort, but they would add considerably to the trail capacity in this category, as indicated in Table 2.7 below. This would significantly offset the intermediate terrain deficit, which can become acute when the Back Bowls are not fully available. Further discussion about the need for intermediate-level terrain is found under Recreation and Alpine Skiing.

Table 2.7. Comparison of intermediate trail capacity added by alternative.			
Alternative	Intermediate Trail Capacity Added	Percent Increase	Total Intermediate Trail Capacity
(A) No Action	90	1%	8,109
(B) Center Ridge	$927+90^* = 1017$	13%	9,036
(C) Proposed Action	$1610+90^* = 1700$	21%	9,719
(D) MDP	$1718+90^* = 1808$	23%	9,827
* The No Action Alternative capacity is assumed to be developed under all other alternatives.			

2.5.1.4 Biodiversity

Biodiversity is a fundamental tenet of the Forest Service policy of ecosystem management that emphasizes sustaining or restoring species diversity and the future productivity of Forest Service lands. Diversity is often gauged by the numbers of species and individuals present in an area. Impacts on biodiversity in the PA would result primarily from the fragmentation and subsequent loss of medium-to-large habitat blocks as well as the

conversion of forested to non-forested habitat. Table 2.8 (below) summarizes forest block sizes under the various alternatives. The loss and fragmentation of spruce-fir old-growth forest is of major concern because it is a basic component of lynx habitat. The amounts of old-growth forest disturbed are depicted in Table 2.5 (above) by alternative. The conversion of forested to non-forested habitat would result from removal of trees and the subsequent increase in grassland and forest edge habitat. Increasing edge and grassland habitats could benefit elk and deer; however, the fragmentation and reduction of forest blocks and forested habitat linkages would adversely impact forest-interior and certain snag-dependent species.

Table 2.8. Summary of the block analysis for the CAT III area.								
Block Size (Acres)	ALTERNATIVE							
	No Action		Center Ridge		Proposed Action		MDP	
	# Blocks	Acres	# Blocks	Acres	# Blocks	Acres	# Blocks	Acres
0-5	35	76	204	248	268	278	366	406
6-50	27	409	78	1,098	82	1,169	111	1,526
51-200	11	1,027	10	906	9	819	11	897
201-500	4	1,316	2	567	2	563	0	0

Within the PA, the results of selecting either the No Action or Center Ridge alternatives would have notably lesser impact than implementation of either the Proposed Action or the MDP Alternative, especially in terms of loss and fragmentation of old-growth forest stands.

Biodiversity was also analyzed on larger landscape and regional area scales (MAPs 9 & 10). Fundamentally, the PA is reflective of the LA in terms of species and habitat types and densities. It is, however, one of the primary undisturbed tracts in the LA that has not been fragmented by the existing ski area, highways, and urban development. The reasonably foreseeable actions that are not part of this proposal but which could cumulatively contribute to the impacts of development in the LA are discussed in the Cumulative Actions section of Chapter 4.

The Regional Area is much larger than the PA and encompasses portions of reasonably undisturbed federal and state managed lands, including two Wildernesses. While development of the CAT III area would also cumulatively contribute to effects on biodiversity on the regional scale, it would not of itself represent a major impact because of its size and current level of diversity in the area.

The PA is one of the few portions of the LA that has had relatively few human-caused habitat alterations during the last 100 years. It was this lack of human alteration that originally qualified the area to be identified as a portion of the larger "Two Elk Roadless Area" in the Forest Service's RARE II analysis of 1977. The Final Environmental Statement for RARE II placed the Two Elk Roadless Area in a non-wilderness, multiple use class. This classification was carried through in the WRNF Plan which designated various portions of the area for downhill skiing, semi-primitive motorized and non-motorized recreation, livestock grazing, and timber production. The results of this designation, along with previously existing trends in commercial development, have been manifested in a situation where the existing ski area to the north, timber harvest and associated roads to the south, and urban developments and highways to the north, east, and west, have substantially fragmented the Two Elk ecosystem. This fragmentation may have already been responsible for the decreasing population

sizes of wildlife species which require relatively large undeveloped areas to remain viable (e.g., lynx, wolverine, goshawk). These factors, along with the comparatively small size of the CAT III area, render the suitability of CAT III to function as a core reserve quite low. More likely is its potential to function as a movement corridor or, more appropriately, a "stepping stone" enabling wildlife to move between areas which probably do function as core reserves, the Holy Cross and Eagles Nest Wildernesses. Assuming a given species is able to cross the Eagle River, Highway 24, and the railroad tracks to the west, and I-70 to the east, the CAT III area could function in this capacity for that species. However, other than a limited amount of information on elk use and movement through the area, there is little or no data to substantiate whether, and for which species, the PA serves this function. If, in fact, the PA does act as a wildlife movement corridor, implementation of the Proposed Action or one of its alternatives could adversely affect its functioning as such. Depending on the alternative, however, this impact would probably be short-term and last only as long as construction activities in the CAT III area. For example, following the completion of construction associated with the Center Ridge Alternative, there would be little activity in the PA during spring and fall, the major periods in which wildlife species are likely to be moving through the area. Consequently, implementation of alternative B or even C would be unlikely to significantly impair its function as a corridor for the simple reason that if a given animal is able to make it past the natural and human-made barriers on either side of the PA, the relatively minor developments within it would probably not restrict the animal's further movement. Under the MDP Alternative, animal movement could be more restricted.

2.5.1.5 Roadless Resource

During public scoping, some members of the public expressed concern about how development of the CAT III area would affect the "Two Elk Roadless Area." The term "roadless area" is one which has frequently been the cause of confusion in public land management and would appear to be so in this case as well. The term has its origins in a 1970's Forest Service inventory and review of undeveloped, unroaded areas across the U.S. In a Final Environmental Statement (FES) in 1979, all 2,919 of the individual areas identified were allocated to three classes for future study or management: 1) wilderness, 2) multiple uses other than wilderness, and 3) needing further study. The Two Elk Roadless Area, which included the present-day CAT III area and the existing Back Bowls, was one of the areas allocated to management for uses other than wilderness in the FES.

The 1979 FES did not actually designate areas as wilderness. In Colorado, the areas identified for wilderness in the FEW became designated wilderness via the Colorado Wilderness Bill of 1980 (P.L. 96-560). It was through this act that the Holy Cross Wilderness Area was designated. In the Colorado Wilderness Bill, Congress noted that the Forest Service would not be required to review the wilderness potential of the lands allocated to multiple use in the 1979 FES until revision of individual Forest Plans was undertaken. In 1984, the initial forest Plan for the WRNF was completed. In it, Two Elk Roadless Area was allocated to a variety of land-use emphases, including timber management, non-motorized recreation, motorized recreation, and downhill skiing.

Since passage of the Colorado Wilderness Act, a series of legal challenges have focused on the issue of how roadless and undeveloped areas must be addressed in NEPA analyses and documents. In some of these cases the courts have held that when agencies consider approving or building projects in undeveloped and roadless areas, the action may be viewed as a "major federal action" and require preparation of an EIS, versus simply an EA. In response to this, Forest Service policy has been refined to require that the impacts on the roadless resource be evaluated in project-level NEPA documents such as the CAT III EIS. Other than this policy for conducting environmental analysis, roadless and undeveloped areas have no formal status or protection. Instead, the Forest Plan provides the direction for management of these areas. In the case of the CAT III area, the Forest Plan management emphasis is for providing downhill skiing opportunities. Consistent with the policy which has

evolved, the CAT III EIS includes an analysis of the impact of the Proposed Action and alternatives on the "roadless resource." This analysis is summarized below.

One of the values often associated with undeveloped areas is its ability to offer opportunities for non-motorized, backcountry recreation opportunities. No public motorized use of the CAT III area is anticipated under any of the alternatives. It would remain open to all of the same recreational activities as are currently pursued there, such as hiking, mountain biking, and horseback riding. However, the setting in which these activities occur would be a more developed one, containing ski lifts, roads, skiways, bridges, and food service facilities. To many, this would no longer represent a "backcountry" recreation opportunity. Those portions of the CAT III area which could continue to offer a backcountry recreation experience under the alternatives is provided in Table 2.9 below.

Table 2.9. CAT III areas providing backcountry recreation opportunities by alternative (acres)			
No Action	Center Ridge	Proposed Action	MDP
3,460	2,460	1,260	<500

During public scoping, some expressed the view that high-elevation, forested ecosystems, such as those occurring in the Two Elk area, are unique and should be preserved. In this portion of Colorado, spruce-fir is the dominant forest cover type in high elevation areas and often comprises the major component of old-growth forest in any given area. The Holy Cross Range District is about 340,000 acres in size. About 70 percent of this area is forested, and approximately 32 percent (108,000 acres) has a spruce-fir cover type. Of the roughly 117,000 acres of wilderness on the Holy Cross Ranger District, about 54 percent (63,000) acres is forested. The spruce-fir component of this area represents 35 percent of the total wilderness acreage and alone comprises 12 percent of the Holy Cross Ranger District. Based on this information, it appears that high elevation, forested ecosystems are relatively common in the surrounding area.

All of the action alternatives involve the installation of developed ski facilities in the CAT III area and the opportunity for future designation of the area as wilderness would be forgone. In addition, development of the area would make any future designation of the area as a Research Natural Area (RNA), in order to study and preserve ecological processes, unlikely. The area is not now, nor has it been in the past, under consideration as an RNA.

Scoping revealed that many attached other ecological considerations to their assessment of how the CAT III development might affect roadless area values. These are addressed above under the heading of Biodiversity.

2.5.2 SUMMARY OF IMPACTS BY IMPORTANT ISSUES

The following is a summary of important issues and concerns keyed to the resources they address. The resources are listed in the same order as they appear in Chapter 4.

2.5.2.1 Physical Resources

2.5.2.1.1 Geology

Geologic considerations in the PA focus mainly on slope stability. Conditions in the area are characteristic of the Minturn geologic formation as it occurs commonly in Eagle County. Over time landscapes have been greatly influenced by large-scale wasting, localized landslides, slope failures, and other types of mass movement. Landslides, slumps, debris-mudflows, and rockfall are the primary features of concern in the PA. Ski area construction can affect stability by undercutting slopes, altering drainage in a way that adds weight and lubricates the soil mantle, and by removal of trees and other vegetation whose roots anchor slopes. Within the PA, geologic conditions have been divided into three broad categories, or units—areas with no identified geologic limitations, areas with *geologic constraints*, and areas with *geologic hazards*. The acreage which would be graded or excavated under each of the action alternatives in the later two classes is displayed in Figure 2.5. Geologic constraints are common in mountainous terrain and many of the facilities on the front side of Vail Ski Area have been constructed in these areas. Accommodations can generally be made in design and construction so as to not significantly affect slope stability in areas of geologic constraint. Areas of geologic hazard should generally be avoided in the location of facilities, or will require special design or construction measures to ensure slope integrity. Much of the area of geologic hazard which would be affected under each of the alternatives are areas of rockfall. Geologic considerations in rockfall areas focuses on more intensive location, design, and construction techniques necessitated by bedrock exposures, rather than concern for maintaining slope stability.

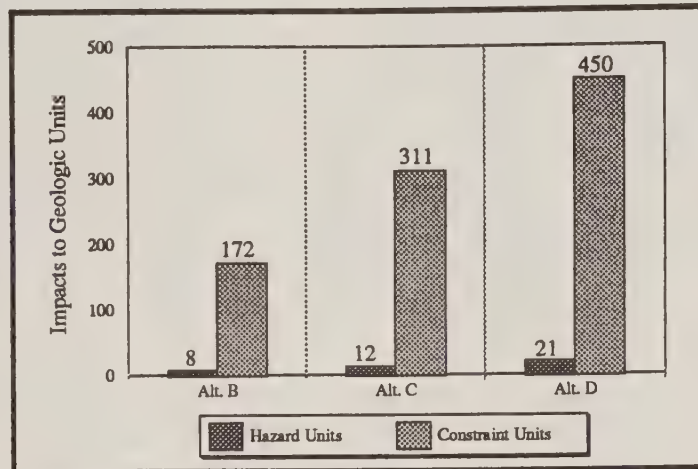


Figure 2.5. Summary of geologic hazards and constraints by alternative (nearest acre).

2.5.2.1.2 Soils

Soils in the PA have formed mainly in colluvium and residuum of the Minturn formation, are generally deep to moderately deep, and well drained. Sandy loam, loamy sand and sandy clay loam, are the most common soil textures, with the content of the rock fragments typically exceeding 35 percent. In general, these soils are moderately susceptible to erosion and compaction, and have moderate revegetation limitations. Ski area development often involves grading and excavation of soils to construct ski trails, skiways, roads, and other facilities. These disturbances remove the vegetative and protective litter and duff cover of the soils, making them more susceptible to sheet rill erosion until revegetated. Ski trail construction would account for a major portion

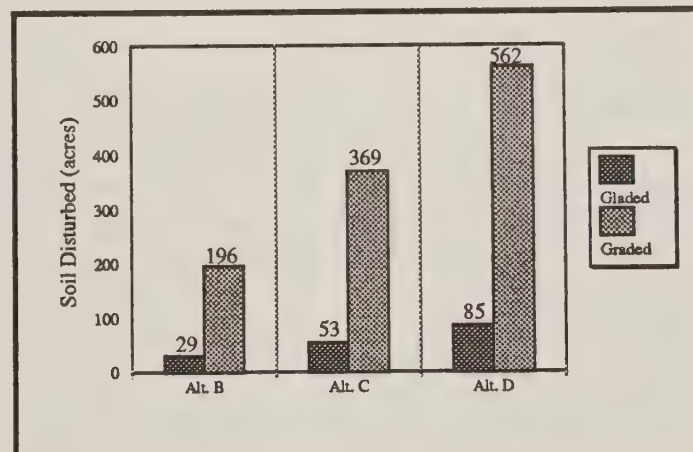


Figure 2.6. Summary of soil impacts by alternative

for a major portion of the soils impacts in the CAT III area. While a significant amount of the ski trails which would be constructed would be in naturally open areas and require little or no ground disturbance, gladed and conventional trails also would account for a substantial portion of the terrain that would be developed for skiing. Construction of gladed trails typically requires only limited soil disturbance, while convention ski trails involve relatively large-scale glading of trail spaces. Figure 3.2 depicts the estimated area (acres) of soils which would be disturbed through gladed trail construction, as well as the area which would be graded for construction of conventional ski trails, roads, and other facilities. Construction would be phased over a 3 to 7 year period (depending on alternative), though the acreages shown are for the total project. All construction would be subject to VA's Construction and Operating Plans which contain Forest Service requirements for erosion control and revegetation. These measures have generally proven effective in similar ski trail construction projects on the front side of the Vail Ski Area.

2.5.2.1.3 Hydrology

The upper Two Elk Creek watershed is approximately 6,645 acres in size and receives about 35 inches of precipitation annually, mostly in the form of snowfall. Average annual water yield from the area is estimated at 8,600 acre-feet. Two Elk Creek channel that has a low to moderate existing sediment supply, low streambank erosion potential, moderate sensitivity to disturbances, and excellent potential for recovery after the cause of a disturbance is corrected.

Two primary areas of concern in ski area development are minimizing impacts to water quality and maintaining stable stream channels. In the case of the CAT III area development, sedimentation resulting from construction of ski trails, roads, skiways, and building sites has the greatest potential impact to water quality. Figure 2.7 displays a *relative* comparison of the potential increase in sedimentation for each of the action alternatives over time. Values shown are not absolute, in that limitations of the model used precluded accounting for many erosion and sediment control measures which would be required under any alternative.

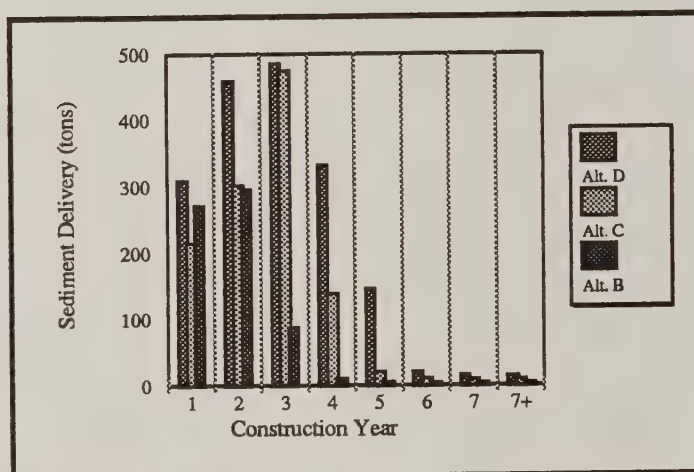


Figure 2.7. Relative sediment delivery potential by alternative using WRENSS modeling.

Channel integrity can be affected by ski area development in a number of ways. First, introduced sediment can exceed the capability of a channel and result in changes in morphology and adverse impacts to fish habitat and other aquatic resources. Second, clearing of trees and other vegetation can reduce evapotranspiration losses, resulting in an increased water yield and changes in flow regimes. These impacts, particularly increases in the volume, timing, and duration of peak flows can also de-stabilize stream channels and impair hydrologic function. No snowmaking or other withdrawals from Two Elk Creek or its tributaries are proposed for this project. Application of BMP and project-specific mitigation measures, especially for those areas in close proximity to channels, should allow for channel integrity to be maintained under all alternatives. Changes in flow regimes and total water yield (48 - 133 acre-feet per year) would be well within the natural range of variability for Two Elk Creek under all of the alternatives and would not cause any perceptible change in channel morphology.

2.5.2.1.4 Air Quality

The TOV is presently in attainment of all federal air quality standards and has adopted programs and policies to maintain air quality. On some peak and high use days during inversions, the Vail area experiences haze problems attributable to increased vehicle emissions, woodburning, and other activities that contribute to airborne particulates. While development of the CAT III area would bring more skiers to Vail, the number and intensity of peak days would not increase. The small number of employees that VA would add due to development of the CAT III area would have little effect on overall air quality. Compared to Eagle County's current and projected growth rate (annualized at 4.5 percent since 1985), these new employees would account for less than 1 percent of the county's projected annual growth. Timber cleared for ski trails, skiways, roads, and other facilities would be either removed from the area and utilized commercially, or burned on site. Varying levels of commercial timber utilization and disposal have been analyzed and are described in the Timber Resources section below. Burning slash and trees introduces emissions into the air, including particles smaller than 10 microns in diameter, or PM₁₀. Figure 2.8 depicts the potential PM₁₀ emissions associated with timber utilization and disposal. Providing that requirements of VA's Burn Plan and Open Burning Permits are followed, none of the alternatives would significantly affect air quality or be in conflict with visibility standards in adjacent Wildernesses.

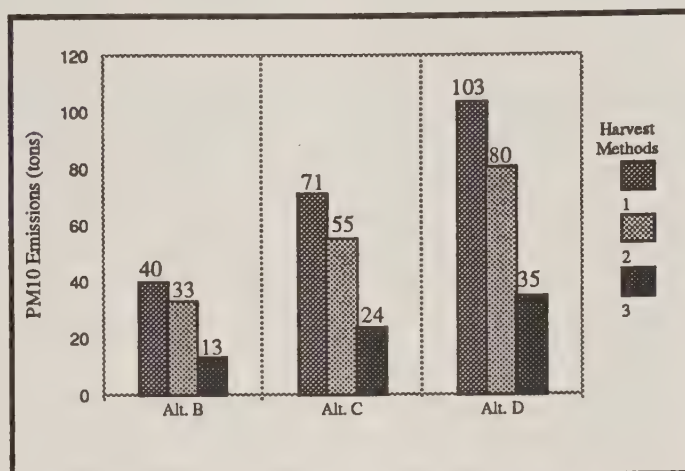


Figure 2.8. Predicted PM₁₀ emissions by alternative using SASEM model.

2.5.2.1.5 Noise

Construction, traffic, and ski area infrastructure currently contribute to the year-round noise level in Vail, with the mix and components of the disturbance varying seasonally. Avalanche control and operation of snowcats used for grooming are components of noise during the ski season. The latter has been a source of concern for some residents along the front side of Vail Ski Area. Vehicle traffic supporting maintenance and development on the front side of Vail Mountain is routine, and the road system has been built to accommodate relatively heavy use by large vehicles. As described in the Timber Resources section, timber cut in the CAT III area could be removed by two different truck haul routes, or by helicopter. One haul route utilizes the front side of the ski area and Vail Road to access I-70. The other requires construction of a short section of temporary road to connect the CAT III area to Lime Creek and existing roads in the Shrine Pass-Vail Pass area. Both would have associated noise impacts, with 30 to 40 truck-trips per season, spanning a three to seven year construction period, depending on the alternative. The front side route would tend to be of most impact to recreationists on the ski area and for residents and others in the TOV. On the other hand, use of helicopters, or the Lime Creek haul route, would create the most potential impacts for wildlife and dispersed recreation. However, the duration of time over which disturbances would occur is reduced when using helicopters due to their greater efficiency. It should be noted that burning timber on site reduces the disruptions caused by either truck traffic or helicopter use. There would be an increase in noise levels within the CAT III area from these activities and general ski area development under any of the action alternatives while construction is in progress. The current closure of China Bowl until July 1 each summer would remain in effect under all alternatives. The effects of noise on wildlife are discussed in the Wildlife and Biodiversity sections of Chapter 4.

2.5.2.2 Biological Environment

2.5.2.2.1 Aquatic Biology

Under the No Action Alternative, Two Elk Creek and the Eagle River would not experience significant changes except those related to natural events or to an accidental fuel spill. Any action alternative selected would contribute at least minor amounts of sedimentation to Two Elk Creek and the Eagle River caused by the construction of ski trails, skiways, roads, bridges, and associated facilities, but the sedimentation increase probably would not impact resident trout. No known threatened, endangered, or sensitive species occur in Two Elk Creek, although the Colorado River cutthroat trout (a Category 2 candidate species) inhabits portions of the Eagle River. There are four species of endangered fish in the Colorado River: the Colorado squawfish, humpback chub, bonytail, and razorback sucker. None of the action alternatives would include increased snowmaking or municipal water usage above that which was disclosed and analyzed in the 1986, EA and DN accompanying the Biological Opinion (BO) issued by the U.S. Fish and Wildlife Service. Consequently, implementation of any of the action alternatives would not impact threatened, endangered, or sensitive fishes through water depletion.

2.5.2.2.2 Vegetation

The project area (PA) for this EIS includes all of the CAT III area, Tea Cup Bowl, a portion of China Bowl (utility corridor), and another small portion of the CAT II area along the north side Two Elk Creek. For the disciplines of Vegetation, Wildlife, and Biodiversity, this EIS also incorporates two broader levels of information and analysis. These areas are referred to as the landscape area (LA) and regional area (RA).

Direct impacts to vegetation from the proposed development would include the removal of vegetation, blading, slope recontouring, glading, and revegetating specific areas to accommodate proposed ski trails and skiways. Understory vegetation in gladed areas would not be cleared, but could be trampled by heavy equipment or timber removal activities. The acres of vegetation potentially affected by each alternative is depicted in Figure 2.9. Once the forest canopy is thinned or removed, understory species adapted for low light conditions would likely be out-competed by plant species that either require or tolerate greater light levels. Additional effects to the vegetation may include changes in the snowmelt regime from increased snow compaction, which would affect plant growth. Vegetation removal could also cause a slight local increase in water yield, as less water would be utilized or evapotranspired from areas cleared of vegetation. This change in the water regime, along with a potentially greater stream silt load, could affect riparian plant populations downstream from the proposed expansion area. While there are no threatened or endangered plants in the PA, some species of Forest Sensitive plants could be affected, although the population viability would not be impacted. Native flora in disturbed areas could be replaced by the seeded plant species used in the revegetation program, although some natural regrowth could also be expected. Disturbance of vegetation could also result in increased populations of noxious weeds already present on the ski area. Impacts to vegetation resulting from

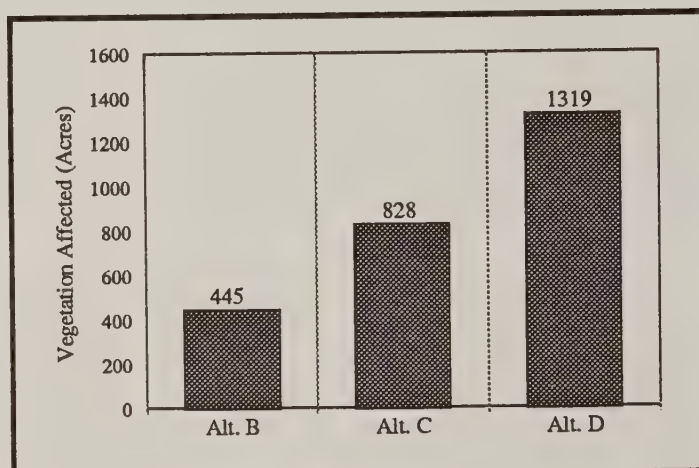


Figure 2.9. Vegetation affected by alternative.

implementation of any of the action alternatives would add to the cumulative acreage of native vegetation types (both forested and non-forested) in the LA and RA that have been, or that may be disturbed, in the foreseeable future.

Implementation of the standard mitigation measures could effectively reduce adverse impacts to vegetation, but there would still be an overall loss in vegetation cover (particularly forest canopy cover) and decrease in native species diversity within the PA. Phased construction of the proposed developments would allow incremental revegetation, thereby slowing the rate of vegetation type conversion, reducing the area of disturbance at any given time, and limiting increased sedimentation and erosion.

2.5.2.2.3 Wetlands

During the development of alternatives, the Forest Service, ACOE, and VA considered avoidance and minimization of impacts to wetlands by planning the placement of facilities in order to have the least damaging practicable effect on wetlands. Besides Forest Service approval, this project would also require an application to the ACOE for an individual permit and submittal of a 404(b)(1) Guidelines Alternative Analysis, which would address the loss of wetland values and functions.

A number of impacts on wetlands and special aquatic sites (SASs) located within the PA could result from the Proposed Action or alternatives to it (Figure 2.10). They could occur as a result of placing culverts, constructing and operating roads, grading wetlands and source areas of hydrology, altering stream courses, placing fill in or dredging material from wetlands, disturbing wetland surfaces, constructing bridges across wetlands, and cutting vegetation in wetlands. The functions of riverine habitats and their surrounding wetlands could be lost by culverting streams and/or altering stream channels. Depending on their magnitude, less severe impacts may not destroy the entire wetland, but might adversely affect portions of the wetland or wetland functional values. The impacts may be permanent, long term, or short term, depending on the degree and extent of the disturbance. Wetlands affected by altering the hydrology, soils, or vegetation could take years to fully redevelop to their pre-disturbance functional level, as could constructed wetlands associated with potential compensatory mitigation projects (if required) intended to replace lost functional values. The acreage of wetlands lost by dredge and fill activities for alternatives B, C, and D would be 0.34, 3.07, and 20.67, respectively. Most of the potential loss of wetlands for Alternative C would occur with the establishment of several specific trails in the East Pete's Bowl while the majority of wetland impacts under implementation of Alternative D would be associated with trails in Commando and East Pete's bowls.

Cutting or trimming vegetation in wetlands without disturbing the soil in order to facilitate skiing over them is not an activity regulated by the ACOE. However, this activity may result in losses or decreases to some wetland functional values by altering the character of the wetland, especially in forested or riparian wetland types. Particularly, clearing or glading of trees on forested seep wetlands could result in the loss of unique microhabitats, where several species of orchids and other uncommon understory hydric species can be found. Cutting willows

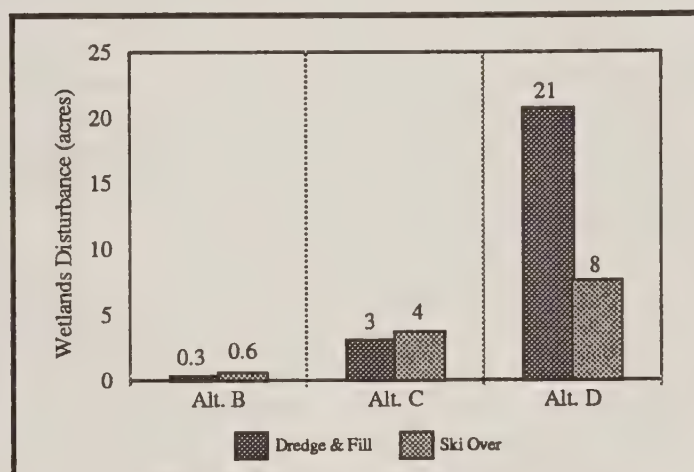


Figure 2.10. Wetlands impacts by alternative.

in riparian shrub wetlands could also affect the macrohabitat of riparian wildlife species, potentially displacing song birds and small mammals that prefer dense cover. Cutting vegetation to ground level may also diminish the ability of a plant's root system to perform bank stabilization functions, resulting in increased bank and soil erosion.

2.5.2.2.4 Wildlife

In general, the construction and operation of any ski trail, lift, road, or associated development would impact wildlife directly and indirectly. The presence of workers and equipment during the construction phase of the project would result in direct impacts to wildlife via the displacement of animals from their home ranges. In the case of relatively mobile species (e.g., coyote, bobcat, birds), these impacts would likely be negligible provided animals could move to unoccupied habitats in the PA and LA. However, less mobile animals, primarily small mammals (e.g., southern red-backed voles, northern pocket gophers, western jumping mouse), would probably experience increased mortality rates as a result of being displaced. Portions of the PA along Two Elk Creek are used by elk during calving season. The closure of China Bowl during May 1 through July 1 to traffic and activity would remain in place under implementation of all alternatives. The Draft EIS concludes that if Alternative B or C were implemented, sufficient elk calving habitat would remain available and usable to support the elk herd currently using the PA. The same is true if Alternative D were implemented but some additional mitigation may be necessary.

The entire PA serves as a big game migration route as deer and elk move from winter to summer range. Some elk and deer also remain resident within the PA during the summer. During the fall, the PA is used again as a migration route as deer and elk drift back to their late fall and winter ranges near Minturn and other location along the Eagle River valley. The EIS concludes that the habitat within the PA would continue to serve the function of facilitating big game migration if any of the action alternatives were implemented, even when the potential impacts are considered in a cumulative fashion.

Direct impacts to wildlife would include the conversion of portions of forest stands to seeded ski trail habitat through lift and trail construction, and localized reductions in forest canopy cover through glading. The creation of conventional ski trails and chairlifts converts forested habitats to a maintained grassland/meadow type through the removal of all trees and revegetation of the area to grasses and forbs. Glading can remove up to 30 percent of the trees, thereby creating a forest savannah habitat. Construction and operation of ski facilities has the potential to reduce and/or fragment breeding, foraging, and wintering habitat for forest-interior and snag-dependent wildlife (e.g., marten, boreal owl, three-toed woodpecker, golden-crowned kinglet, mountain bluebird). Conversely, construction of maintained grassland/meadow openings through forest blocks would create habitat for edge-tolerant species (e.g., broad-tailed humming bird, snowshoe hare, meadow vole). The result of these habitat conversions may directly affect wildlife by increasing populations of edge-tolerant species and decreasing populations of forest-interior species.

Loss of wildlife habitat through residential development and increased human disturbance in the LA and RA are probably the greatest long term threats to the viability of wildlife populations. Development of existing habitat on and off public lands would displace nearly all species except those tolerant of such developments (e.g., American robin, hairy woodpecker, western jumping mouse).

The effects of disturbance and loss of habitat differ among the alternatives. A brief summary of the effects by alternative follows. The No Action Alternative would have the fewest short-term adverse effects to wildlife of any of the alternatives. Under the No Action Alternative, there would be no direct, indirect, or cumulative impacts

to any of the wildlife habitats associated with construction of lifts, trails, glades, restaurants, or roads in the CAT III area. However, ongoing impacts attributable to general recreation, off-site developments, and ski facilities in the existing ski area would continue. Existing summer recreational activities, such as camping, mountain biking, hunting, and hiking are concentrated along Two Elk Creek and along the ridges above Super Bowl and Commando Bowl. On the front side of the ski area summer recreation includes a relatively intense program of activities, such as mountain biking, hiking, and picnicking. The use of these areas for recreational activities would most likely increase and continue to directly affect wildlife through disturbance and general presence of human activities. Summer recreational activities in wildlife habitat can interrupt or cause abandonment of wildlife breeding activities for species sensitive to human interaction (Howard and Postovit 1987; Banci 1994).

Impacts under implementation of the Center Ridge Alternative would be restricted to those areas associated with Super Bowl, Ridge Lift, and Tea Cup pods (MAP 11). About 445 acres would be affected as a result of constructing of lifts, trails, glades, roads, and a food deck. Of that 445 acres, approximately 211 acres would actually be converted from various existing habitat types to graded ski trails and associated facilities. An additional 175 acres of forest would be gladed. The conversion of 30 acres of aspen, 57 acres of spruce-fir, 170 acres of lodgepole pine, and 7 acres of mixed forest to ski trails and associated developments would reduce the availability of potential nesting, foraging, and wintering habitat for interior-forest species and snag-dependent species, while creating habitat for some grassland/meadow and edge-tolerant species. The majority of the existing 158 acres of grassland/meadow and savannah habitat types affected by this alternative would not be altered as this area would only be skied over. However, compaction of snow by skiers and groomers could potentially act as a barrier to subnivean mammals such as pocket gophers, southern red-backed voles, and shrews. Snow compaction would also allow predators such as coyotes and bobcats to utilize these areas that would otherwise be unavailable to them due to deep, uncompacted snow.

Implementation of the Proposed Action would have greater impacts on wildlife than those associated with the No Action and Center Ridge Alternatives. About 828 acres would be affected through direct removal or secondary effects due to the construction of lifts, trails, glades, utilities, roads, food decks, and a restaurant (MAP 12). About 354 acres would be converted from various existing habitat types to seeded ski trails and associated facilities. An additional 345 acres would be gladed. The conversion of 22 acres of aspen, 88 acres of spruce-fir, 243 acres of lodgepole pine, and 29 acres of mixed forest would reduce the availability of potential nesting, foraging, and wintering habitat for forest-interior and snag-dependent species, while creating habitat for some edge-tolerant species. The majority of the existing grassland/meadow and savannah habitat types would not be impacted from a wildlife standpoint, as this area would only be skied over. This would include approximately 12 acres of grassland/meadow required for a utility corridor from the top of Vail Mountain to the proposed restaurant.

The MDP Alternative would involve the most extensive development of the PA, relative to the other alternatives, and would have the greatest impact on wildlife. About 1,319 acres would be affected either directly or in a secondary manner, due to the construction of lifts, utilities, trails, glades, roads, food decks, and a restaurant (MAP 13). About 571 acres would be converted from various existing habitat types to seeded ski trails and associated facilities. An additional 492 acres would be gladed. The conversion of 32 acres of aspen, 302 acres of spruce-fir, 353 acres of lodgepole pine, and 166 acres of mixed forest to ski trails would reduce the availability of potential nesting, foraging, and wintering habitat for interior-forest species and snag-dependent species, while increasing habitat for edge-tolerant species. The reduction of snags and downed timber would reduce some denning habitat for marten. However, increases in foraging habitat associated with the creation of forest/meadow edges may also occur. The majority of the existing grassland/meadow and savannah habitat types would not need to be altered to provide for skiing in these areas.

Several other projects in the area could combine in an additive fashion with this proposal to adversely affect wildlife. If the private land on the west slope of Battle Mountain, east of Highway 24 near Gilman, were developed it would cumulatively add to impacts on elk, deer, black bear, and numerous other species that use the area during various seasons. If such development included housing and year round human activity, an increase in human/wildlife interactions would be expected, particularly with elk and black bear. Development of this site would likely force animals returning from their summer range to use a narrower migration route between Game Creek and Two Elk Creek. More urban development in the LA would likely lead to increases in vehicular traffic on Highway 24 and I-70 and the number of vehicle/wildlife collisions occurring when wildlife attempt to cross these highways.

Timber harvest has occurred, is currently being conducted, or is planned on the National Forest on several areas within the LA and RA. Harvest of some stands has reduced the available habitat for forest-interior species (e.g., goshawks, three-toed woodpeckers, boreal owls, marten, and southern red-backed voles) while increasing preferred habitat for other species such as deer and elk. Future timber harvest have the potential to affect wildlife habitat in similar ways, depending on how they are designed and implemented.

Winter and summer recreation in the LA and RA adversely impact those species that are intolerant of such disturbance. Projected increases in winter and summer recreation (Chapter 4: Recreation) suggest that disturbance to wildlife would increase with or without any future developments. Increased access to the area from the construction of logging roads and new trails, and the encroachment of urban developments, have the potential to accelerate the increase in recreation within the LA and RA.

Several adverse impacts to wildlife are unavoidable and cannot be mitigated. These include loss of functions served by forested and forest-interior habitats for species dependent on these vegetation types. Of particular concern are losses occurring in old-growth spruce-fir stands, which would decrease potential habitat for lynx, marten, boreal owls, three-toed woodpeckers, golden-crowned kinglets, and other wildlife associated with this successional stage. The overall result of these habitat manipulations would be to reduce the value of the PA to many forest-interior species. The temporary and permanent displacement of individuals from the PA would likely occur from the development of any of the action alternatives. Temporary and permanent displacement of individuals would also occur from the increased human/wildlife interactions during winter and summer from all the alternatives, including the No Action Alternative. Mortality of individuals would likely occur directly from construction activities and indirectly from displacement of animals from their home ranges. In general, the BE concludes that individuals for some of the fish, and wildlife species listed by the WRNF as Forest Sensitive may be adversely affected but that implementation of any of the action alternatives would not cause a trend toward federal listing nor a loss in species viability rangewide.

2.5.2.2.5 Biodiversity

Under current Forest Service Policy, NFS lands are managed for biological diversity through an approach called Ecosystem Management. The goal of this system is to sustain (or restore) the diversity, resilience, and future productivity of NFS lands. Increased diversity of habitat types usually increases the number of species and individuals present, provided that habitat patches are big enough to maintain viable populations. Ski area development tends to create habitat alterations that generally result in forest fragmentation through the creation of maintained ski trails and associated facilities. Implementation of any action alternative would tend to fragment existing forest, reduce forest block size, increase edge habitat, and remove forest habitat linkages as well as convert forested to non-forested habitat. These changes would increase the percentage of the ski area that is in a state of maintained grassland. Potential decreases in biodiversity from development and operation would not

be limited to birds and mammals. Biodiversity, as measured by native plant species richness within habitat types, would also potentially decrease in areas where trails are cleared and grading and construction occur.

Potential changes to biodiversity were assessed at the PA, LA, and RA scales. This three-tiered approach allowed for quantitative and qualitative assessments of the various alternatives on biodiversity especially from a cumulative standpoint. Potential changes in biodiversity were estimated through an analysis of predicted changes in forest block size resulting from the implementation of each alternative. Fragmentation and reduction of average block size of forested habitats would occur within the PA through implementation of any of the action alternatives. The PA is one of the few portions of the LA that has had relatively little human-caused habitat alterations during the last 100 years. The existing ski area to the north, timber harvest to the south, and urban developments and highways to the north, east, and west have substantially fragmented the ecosystem. These previous developments may already have contributed to decreasing populations of several wildlife species such as lynx, wolverine, and goshawk. Table 2.10 compares the availability of habitat for some wildlife species within the PA.

Table 2.10. Available wildlife habitat for some species within the PA by alternative.							
SPECIES	Alternative						
	No Action	Center Ridge		Proposed Action		MDP	
Forest Interior Species	Acres	Acres	% Change	Acres	% Change	Acres	% Change
Marten	1028	971	-6	865	-16	726	-29
Boreal Owl	1028	971	-6	865	-16	726	-29
Three-toed woodpecker	1028	971	-6	865	-16	726	-29
Golden-crowned kinglet	1028	971	-6	865	-16	726	-29
Lynx (denning habitat)	1028	971	-6	865	-16	726	-29
Goshawk (nesting)	292	0	0	0	0	228	-22
Southern red-backed vole	2048	1815	-11	1560	-24	1227	-40
Grassland/Meadow & Edge Habitat Species							
Deer/Elk (% cover to forage ratio)	68:32	61:39	± 7	55:45	± 13	46:54	± 22
White-crowned sparrow	983	1006	+ 2	1006	+ 2	1006	+ 2
Snowshoe hare	1351	1341	-1	1223	-9	1085	-20
Blue grouse	3424	3656	+ 7	3830	+ 12	4004	+ 17
Wilson's warbler	76	75	-1	70	-8	53	-30

Fragmentation, at the levels that would result from implementation of the Proposed Action or the MDP Alternative, would further reduce the suitability of the area for these and other species requiring relatively large blocks of undisturbed forest. Figure 2.11 depicts potential the changes in block size under each alternative.

During public scoping, concern was expressed that development of the CAT III area would adversely affect the viability of the Two Elk Creek area as a wildlife corridor between the Eagle's Nest and Holy Cross Wildernesses. While elk and other species move through the PA passing between winter and summer ranges, it is not known which if any species are dependent on the PA or LA for a specific wilderness-to-wilderness movement. Implementation of any of the action alternatives could reduce, though not eliminate, the value of the PA as a corridor for certain wildlife species, and could change the biological value of the area over time. Most adverse effects to biodiversity in the LA have occurred due to the development of the TOV, other towns in the LA, and the I-70 corridor.

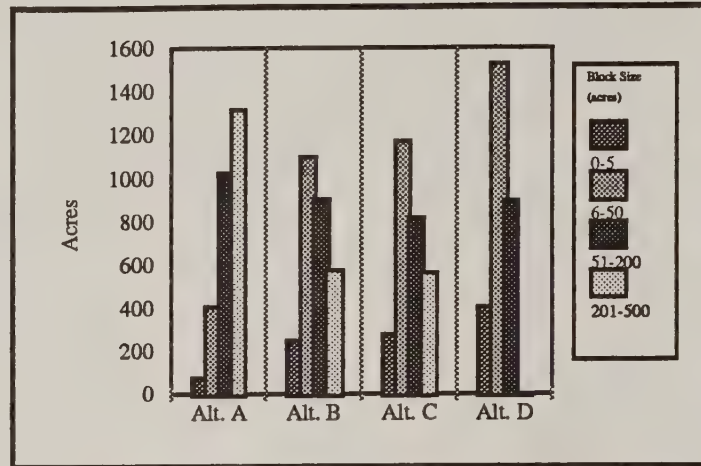


Figure 2.11. Total acres in each of four forest block-size classes in the PA by alternative.

The relative change to biodiversity as a result of implementing the Proposed Action would be greatest when measured at the PA scale, somewhat less at the LA scale, and barely measurable on the RA scale. It is likely that Alternatives A or B would have little to no effect on biodiversity on the LA and RA scales, while implementation of Alternative C or D would have measurably more impact at those scales.

For example, a large block of land in the southwest portion of the LA is located near Gilman and the Town of Red Cliff. Development of the area has been discussed, but there are no formal plans for development. Timber harvest has occurred south and east of the PA. As well, timber harvest is planned, or ongoing to the south of the LA in Hank's Gulch and the Wearyman Creek areas. Timber harvest was considered several years ago in the Timber Creek drainage. However, it was withdrawn in order to preserve future options, and to allow for more information to be gathered. Harvest in the area remains a possibility, depending on environmental and other considerations. These activities could contribute cumulatively to fragmentation. Harvest in areas

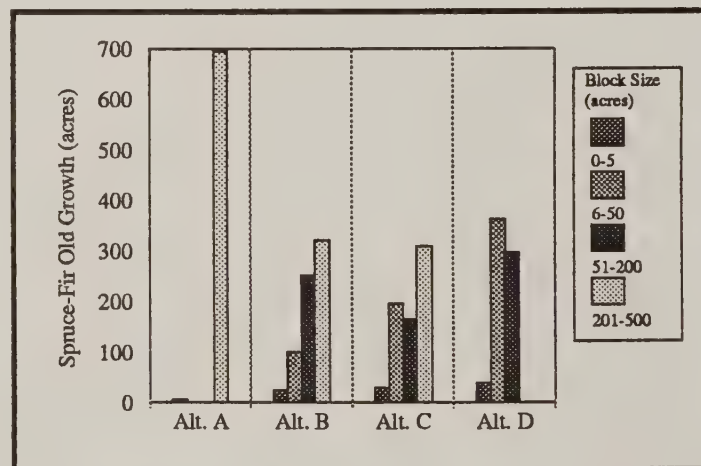


Figure 2.12. Spruce-fir old-growth forest block-size classes in the PA by alternative.

of old-growth forest in Timber Creek together with implementation of either Alternative C or D, has the potential to fragment and reduce the available forest-interior habitat in the LA, depending on the design of the sale. Figure 2.12 depicts potential changes in old-growth forest block sizes under each alternative.

On the north portion of the LA, ski trails and related facilities have created extensive fragmentation. Several ski trails in the CAT I and II areas approved in the 1986 DN, have not yet been built. Some have the potential to further fragment the remaining interior-forest habitat remaining on the front side of Vail Mountain.

2.5.2.3 Human Environment

2.5.2.3.1 Cultural Resources

Prehistorically, the PA was used by Indians for hunting and gathering, although no evidence of prehistoric use was found during archaeological surveys. Historical use of the area is also thought to be minimal. None of the sites surveyed within the area are eligible for listing in the National Register of Historic Places according to the State Historic Preservation Officer for the Colorado Historical Society. However, it was stipulated that further testing of one site, not in the vicinity of any proposed development, would be necessary prior to any development near that site. Representatives from the Ute Indian Tribe who have visited the area did not identify any sites with cultural significance.

2.5.2.3.2 Land Use

A MDP is required as a condition of VA's SUP with the Forest Service. All action alternatives would involve acceptance of an amended MDP for the CAT III area. Forest Service policy requires that only lands that are necessary to the operation and function of the ski area; or are needed for expansion in the foreseeable future; or are necessary to help protect public health and safety should remain under a SUP. None of the alternatives in this EIS develop all lands within the CAT III area. Consequently, they offer the possibility to reduce the extent of the SUP boundary. If a decision is made to modify the SUP boundary, it will be noted specifically in the ROD. Such a modification could also occur after the ROD is issued, following more detailed review of operational and safety considerations. Development of the CAT III area would not require, or lead to, other SUPs being issued for activities such as outfitting and guiding.

Development of the CAT III area would have little effect on land uses and activities on surrounding National Forest System lands. There would be little or no impact to the Holy Cross or Eagles Nest Wildernesses, or its users. Livestock grazing would continue in and around the CAT III area, though some adjustment in patterns of use could be necessary. Having been withdrawn from mineral location and entry under the General Mining Laws, the CAT III area would remain closed to mineral development activities for a period of at least 15 years.

Development alternatives would change the roadless character of the CAT III area to varying degrees. Though all of the same recreation opportunities would remain available within it, recreation would be take place in a more developed setting than is currently the case. Under Forest Service review and evaluation processes beginning in the 1970's, followed by the Colorado Wilderness Bill in 1980, and the 1984 WRNF Forest Plan, it has been determined that the CAT III area would be managed to emphasize downhill skiing opportunities. The area has no special status or designation other than the management direction, standards, and guidelines contained in the Forest Plan. Section II above includes a more detailed discussion of other facets of the roadless issue as it was related during scoping.

Growth and development in the Vail Valley would continue under all alternatives, including No Action. Because of the small number of employees associated with development of the CAT III area and the wide geographic area affected, implementation of any of the alternatives would add to this situation in only a minor way. Development of private lands is governed by county and local government land use plans and zoning.

2.5.2.3.3 Recreation

Under the No Action Alternative there would be no development in the CAT III area and no project-induced impacts on non-skiing recreation. Current types of and trends in non-skiing recreational use would be expected to continue, including a general increase in the popularity of activities such as hiking and mountain biking.

The action alternatives would vary in the extent of area developed and related impacts, but they do not substantially differ in the types of impacts resulting from construction, development and operation of ski area facilities in the CAT III area. Under all action alternatives the terrain actually developed would undergo a fundamental change from natural forests and glades to developed skiways, roads, and lifts. Additionally, the construction associated with all action alternatives would create noise that could detract from the recreational experience for hikers, mountain bikers, and other non-skiing users. This impact would depend on the amount of area being disturbed and the number of seasons over which construction would take place. Unless access is managed or controlled, the presence of ski facilities in the PA could attract additional recreational use into the area. This would be more likely under the MDP Alternative which requires that a short, temporary timber haul road be built, connecting the CAT III area to existing roads in Lime Creek.

Ski area facilities which would be constructed along the Two Elk Creek Trail could detract from the user's experience. Because of the more extensive development along this corridor, the MDP Alternative would have a greater impact for trail users. None of the alternatives would be in conflict with the National Recreation status of the Two Elk Trail. During construction, it is possible that some temporary use restrictions may be necessary on the Two Elk Trail. Development in Commando and East Pete's bowls could affect the experience for users of the Commando Run Trail somewhat. However, none of the CAT III developments would physically impinge upon the trail itself and, for the most part, development would be screened by vegetation and topography from trail users. The MDP Alternative, with more development in the eastern portion of the PA, would place facilities in the closest proximity to the Commando Run Trail. On that portion of the Commando Trail traversing Mongolia Bowl, within the developed ski area, trail users would be able to look south and see development in Commando and East Pete's bowls.

Under the No Action Alternative there would be no development in the CAT III area and no project-induced impacts on non-skiing recreation. Current types of and trends in non-skiing recreational use would be expected to continue, including a "backcountry" experience and terrain for activities such as hiking, mountain biking, and hunting. The non-skiing recreational use of Forest System lands in this region is increasing, and growth in these activities is expected to be sustained for the foreseeable future.

The action alternatives would vary in the extent of area developed and related impacts, but they do not substantially differ in the types of impacts resulting from construction, development, operation, and timber harvest activities in the CAT III area.

2.5.2.3.4 Alpine Skiing

Improvement of alpine skiing is the reason for the proposed CAT III development. Specifically, the intent is to improve skiing quality, reliability, and terrain mix at Vail Ski Area, thereby setting the stage for increased off-peak skier visitation. This in turn would make more efficient use of existing on- and off-mountain infrastructure and help stabilize fluctuations in the community's economy. This development would take place in the context of the manage-to program established in the ski area's MDP and reaffirmed in the Agreement. In light of the

manage-to program's 19,900 SAOT threshold, ski area capacity is addressed in this analysis primarily as a tool for addressing the issues of reliability and terrain mix.

Specific concerns associated with the proposed development include: the need for the CAT III development in terms of current alpine skiing supply and demand, the potential for crowding at key locations on the mountain, the accessibility of the CAT III area, and skier safety and management. These topics, combined with the intended improvements to skiing quality, reliability, and terrain mix, provide the framework for the alpine skiing analysis. Conclusions regarding the alternatives' impacts in each of these areas are summarized below.

To assess the need for the expansion in terms of alpine skiing supply and demand, several key points should be noted:

- ◆ Growth in Colorado skier visits has slowed but continues at a variable rate. Eagle County and Vail Ski Area have generally fared better than state norms.
- ◆ There is no evident shortage in supply of skiing opportunities in the state or locally, but neither is there a clear surplus.
- ◆ Increasing competition among resorts for destination skiers has made improving quality and service a prerequisite to retaining or increasing market share.
- ◆ Vail Ski Area's current capacity is utilized at a higher rate than most Colorado or U.S. ski areas, indicating that demand is approaching supply.

In short, supply and demand information does not clearly support or refute the need for CAT III development, but qualitative improvements to the experience offered by the ski area do seem warranted. In this regard, Alternative A (the No Action Alternative) offers the least gain, while the benefits achieved increase from Alternative A through Alternative C (the Center Ridge, Proposed Action, and MDP Alternatives).

The quality issue centers on the mutual desire of VA and the Forest Service to maintain the range of unique and high-quality skiing opportunities which have made Vail Ski Area a cornerstone of Colorado's ski industry. Key aspects of quality are developing new glade and bowl skiing, which is highly sought after, and freshening the experience provided by the ski area to maintain the existing clientele and to attract new skiers. Development of more—and more varied—terrain is particularly important in building off-peak visitation; longer stays by destination skiers require a wider range of skiing options to occupy their time. These improvements to quality would be minimal under Alternative A and would increase across the range of development alternatives, from Alternative A through Alternative C.

As noted, the ski area capacity issue is addressed primarily to provide a tool for quantitatively addressing skiing reliability and terrain mix. Beyond that, capacity has little bearing on this analysis, since the 19,900 SAOT manage-to threshold—not ski area capacity—would actually limit skier numbers under all alternatives. The capacity estimate used in this analysis is trail capacity, since it is based on skiable acreage, a fixed, objective figure, and on desired skier densities, a key element of a ski area's quality objectives. The densities used were drawn from VA's Quality Management Guidelines, established in the 1986 MDP. Figure 2.13 indicates trail capacity increases occurring under each alternative relative to the 19,900 SAOT manage-to threshold.

These trail capacity figures do not indicate anticipated skier visitation, but they do provide a quantitative basis for addressing skiing reliability and terrain mix.

Another capacity-related issue is utilization of existing capacity. Review of past data on skier visits indicates clear peaks around Christmas/New Year's Day, Presidents' Day, and spring break. Visitation is also uniformly higher on weekends than weekdays. This pattern indicates the potential for significant increases in yearly skier-visit totals within the framework of the manage-to program. As noted in the discussions of skiing quality, reliability, and terrain mix, the degree to which this potential is realized is roughly proportional to the amount of CAT III development, increasing from Alternative A through Alternative C.

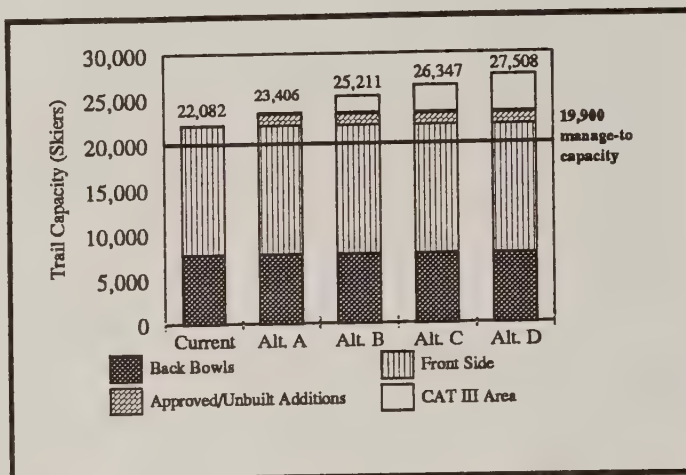


Figure 2.13. Trail capacity increases relative to the 19,900 manage-to capacity threshold.

In regard to reliability of skiing, the primary issue is the deficit of overall trail capacity which results from limited use or closure of the Back Bowls due to inadequate snow or poor visibility. This can cause front-side crowding and diminish the skiing experience when it occurs on peak days, as it has a number of times in the past. Figure 2.14 indicates the degree to which each alternative would offset the trail capacity deficits which would occur if 19,900 skiers were on the mountain with the Back Bowls open and with the Back Bowls closed. The deficit without the Back Bowls is calculated on the basis of Back Bowl lift capacity rather than trail capacity, since lift capacity is the limiting factor.

Alternative A would leave a potential deficit even with the Back Bowls fully used. All the development alternatives would eliminate the potential deficit with the Back Bowls open and significantly offset the deficit when the Back Bowls were not in use. Only Alternative D would functionally eliminate the possibility of a deficit with the Back Bowls completely closed.

Terrain mix considerations closely parallel the reliability issue. Intermediate skiers currently comprise 50 percent of the ski area's visitors, and that percentage is growing. Conversely, only 36 percent of the ski area's trail capacity falls in the intermediate category. If 19,900 skiers were on the mountain, this would result in a 1,913-skier intermediate trail capacity deficit with the Back Bowls in full use, and a 5,260-skier deficit with the Back Bowls not in use. Figure 2.15 compares the intermediate capacity added under each alternative to these potential deficits.

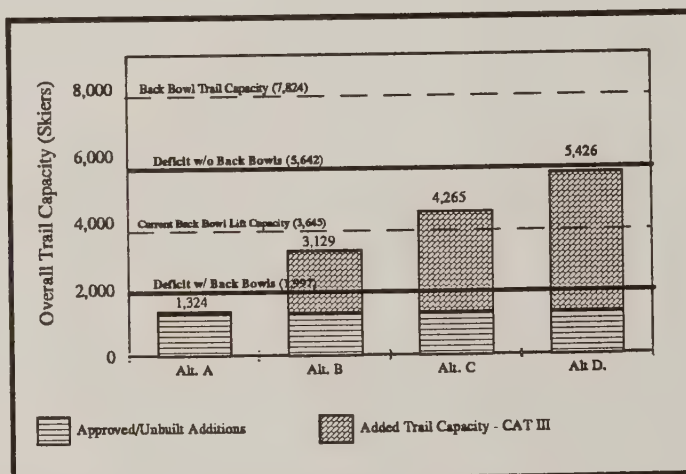


Figure 2.14. Overall trail capacity by alternative compared to existing and potential deficits.

Since most new terrain to be developed under Alternative A is beginner or advanced, this alternative would not notably alter the current situation. The development alternatives would significantly offset the existing deficit with the Back Bowls in use; Alternatives C and D would virtually eliminate it. However, if the Back Bowls were closed on a near-capacity day, a large deficit would remain.

In regard to skier densities, the concern is crowding at key points on the front side, specifically around Mid-Vail during mid-day and on upper Flapjack, a major egress route, at the end of the day. While all alternatives would potentially add skiers to these approved lift upgrades coupled with standard skier traffic control measures such as fencing, should eliminate any serious problem with crowding regardless of the alternative implemented.

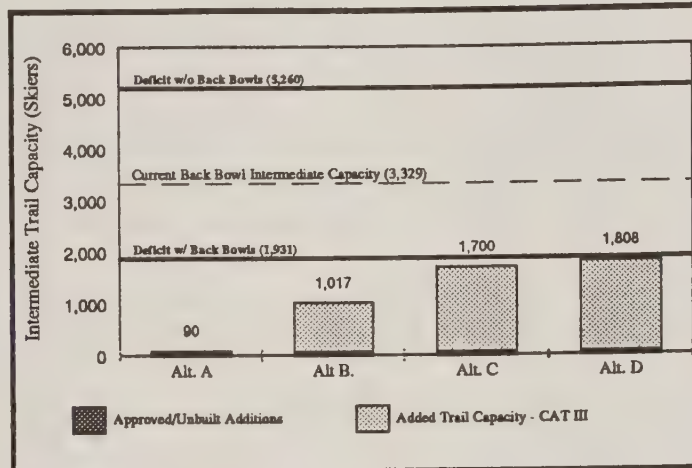


Figure 2.15. Comparison of additional intermediate trail capacity by alternative to potential deficits.

The next issue is the accessibility of the CAT III area and, in particular, whether existing and proposed infrastructure and services would adequately support skiing in the area. The first point to note is that approved lift upgrades will substantially improve front-side circulation and access to the Back Bowls and hence the CAT III area. Beyond that, once skiers were at the base of the Back Bowls, they would only have to cross Two Elk Creek and board a lift to access skiing in the CAT III area. Each of the development alternatives would include the Tea Cup Bowl Lift, which would improve egress as well as allowing downloading to access CAT III if the Back Bowls were not skiable. Finally, each of the development alternatives includes appropriate food services, warming huts, and ski patrol facilities. In short, the accessibility of the CAT III area would not be a major factor in provision of adequate skier support regardless of the alternative implemented.

The last issue is skier safety and management, specifically snow avalanche and out-of-area skiing. Alternative A would not increase exposure to either of these potential risks, as no new avalanche paths would be involved, and back country access would not be affected. The development alternatives would involve some terrain in potential avalanche zones, but these zones have been studied and control measures which have proven effective are available. Likewise, all the development alternatives would provide new access to backcountry areas. However, Forest Service policy generally allows for use of lifts to access back-country skiing except under especially hazardous conditions. Further, specific boundary management issues and closure considerations are dealt with in a Boundary Management Plan prepared by VA and the Forest Service. In light of these considerations, skier safety and management would not be notably impacted by implementation of any of the alternatives under consideration.

2.5.2.3.5 Socioeconomics

The economic contribution of ski areas in Colorado is well documented. Resorts operating on federal lands generated approximately \$3.2 billion in total economic activity and provided about 86,000 full-time-equivalent jobs during the 1994/95 ski season. With Vail and Beaver Creek ski areas combining to comprise 18 percent of Colorado's skier visits during the 1994/95 season, such impacts are clearly important at the local level. The Vail Ski Area alone accounts for about 14 percent of state skier visits.

Overall, Vail has evolved to the status of a mature resort community. Aside from virtually total social and economic dependence on recreation, a key aspect of a mature resort community is recognition of problems threatening the quality of life, active planning to overcome them, and attaining the financial resources to do so. The limited scope of this analysis indicates that the few key problems are recognized. In the Vail area, skier-generated revenues have allowed local governments to maintain a high level of public services. Police and fire protection, emergency services, schools, water, sewer treatment, solid waste disposal, and other core community services face some challenges as the community continues to grow. However, the size of the planning staffs employed at various levels, the scope and volume of planning initiatives underway, and the number of planning documents produced of late show the high level of focused planning activity.

The situation in communities outside the immediate Vail area is somewhat different. Some residents of older, established communities such as Minturn, Red Cliff, Leadville, Gypsum and Eagle typically do not share the view of Vail residents that the resort economy, with its benefits and costs to quality of life, is desirable or should dominate the region. Some feel that their community's integrity is at risk. In a more objective sense, impacts in areas such as affordable housing and community services are felt more keenly in communities without Vail's resources to deal effectively with them. On the positive side, the more stable employment base afforded by resort development undoubtedly helps maintain some of these communities.

Regarding triggers for potential impacts, two aspects of the Proposed Action and alternatives were identified: 1) potentially increased numbers of off-peak skiers, and 2) expanded VA staff associated with the proposed improvements. Two key assumptions were made in limiting the analysis to these two triggers. First, no increase in peak-day skier numbers or the number of peak days per season is anticipated. VA may increase off-peak visitation, but their approved manage-to SAOT capacity of 19,900 will remain in place, as stipulated in their Forest Service SUP and Master Development Plan. The Agreement outlines measures to maintain this limit. Second, many pertinent aspects of the community's current infrastructure have been developed on the basis of the long-standing 19,900 manage-to figure and are underutilized during off-peak periods. The 19,900 SAOT figure was formally evaluated in the 1986 EA and was approached in the 1988 season. Thus, variables such as bed base, restaurant capacity, and employment in the skier service and retailing sectors are not at issue.

As in most rapidly developing resort communities in Colorado and elsewhere, affordable housing for workers has become a problem and is now widely recognized as a critical issue. Seasonal crowding in Vail area temporary rental units is common, workers turn down employment in the area because of the difficulty of finding adequate housing, and employers have difficulty filling some positions as a result. The most obvious factor in the housing shortage is rapid population growth over recent years. The county master plan projects a census-population increase of 32 percent, to 29,000, by the year 2000. The TOV anticipates 16 percent growth in average winter population, including both visitors and residents, over the same period. Growth of the county's labor force roughly parallels that of the general population, and the lower-paid retail and service sectors now comprise nearly 75 percent of the workforce. Since 1990, a number of developments have been completed in the Vail region with about 570 units built from 1993 to present, and 54 new units to be completed this year. However, affordable housing remains a primary issue in the region.

The housing situation has contributed to an incremental, down-valley movement of the labor force as the Vail area workers move as far as Eagle, Leadville, and even Glenwood Springs to find affordable housing. Negative effects in the outlying communities include escalated housing prices, displacement of lower-income people, insufficient child-care options, and stress on services in communities which do not derive the tax revenues generated by the ski resort economy in Vail.

It is impossible to predict the impact of the various development alternatives on skier visitation given the number of variables involved. Some of these variables, including lift-pass pricing, snowmaking, marketing promotions and special travel arrangements, are controlled by the resort's management. Others, such as climatic variability and economic conditions from local to international levels, are basically uncontrollable. The major existing limitation to skier numbers is the Forest Service requirement that VA adhere to the manage-to strategy with its 19,900 SAOT manage-to capacity, which has been reinforced by the Agreement. Existing village infrastructure limitations (e.g., parking, transportation, and beds) are generally in balance with the manage-to capacity, and significant changes to this situation appear unlikely.

The primary difference between the No Action Alternative and the development alternatives in regard to skier numbers is that it would be more difficult to maintain or increase current growth in season-long numbers under the No Action Alternative. Annual skier days at Vail Ski Area have increased at just under 2 percent per year since 1983, to about 1.5 million. Each additional percentage point of increase at this time would equate to 15,000 more skier days through the course of the average 142-day ski season. This number, in turn, is the equivalent of 41 year-round residents, which is less than 0.2 percent of the County's current population. To summarize the situation, the No Action Alternative could precipitate either a decline in skier numbers or an increased proportion of day skiers in a stable or growing total. Conversely, the action alternatives should help maintain or increase current rates of growth in annual skier visitation and retain the area's attraction to destination skiers.

Under the No Action Alternative about 55 employees would be added to the VA workforce. That number would probably be added (cumulative) to the implementation of the Center Ridge, Proposed Action, and MDP alternatives would add approximately 23, 71, and 75 employees, respectively. It should be noted that the additional employees associated with these alternatives would augment normal growth in VA's staff. Since 1988, VA's employee numbers have grown at an average annual rate of about 6 percent. This baseline trend would likely continue. To put these employee numbers in perspective, the Department of Labor and Employment (1994) estimated the County's 1993 workforce at 14,483, growing at 2.7 percent annually from 1985 to 1993.

In terms of sales tax revenues, a 1-percent increase in destination skier numbers would generate an additional \$228,000 per year, with 4 percent to the TOV, 1 percent to Eagle County, and 3 percent to the State. Similarly, for day skiers, the total added revenue would be \$60,000 per year. While the TOV's sales tax revenues totaled over \$10 million last year, these smaller, incremental amounts remain important. Sales tax revenues of this magnitude support the community's economy and make the high costs of providing public services tolerable. On the local scene, in the immediate Vail area, this suggests that the most important potential impact to note is the damage to the private and public economies that would result from a significant decrease in skier visitation. A decrease could occur under any alternative but would be more likely under the No Action Alternative. Such a downturn could conceivably be significant. Implementation of an action Alternative, with a higher potential to maintain or increase skier numbers, should have a positive effect on the local economy. The significance of the lower per-skier spending of day skiers also should be considered in assessing the down side of the No Action Alternative. Considerably more skiers would be required to maintain a given revenue stream if the balance of skier visitation were to shift away from destination skiers.

Primarily through an increase in VA staff, who would be long-term residents, development of the CAT III area would add to the shift in the character of the area. However, the small increases in staff would represent a very minor impact in the context of the larger forces at work. While peak-day skier numbers will not increase, residents are likely to experience some effect from prolonged periods of higher visitation. For example, even though roads and streets can accommodate peak-day traffic volumes, motorists are likely to notice more frequent "busy" days.

Rising living and real estate costs in the Vail Valley have made home ownership difficult for many residents and caused others to move to locations that require long commutes to places of employment. Good schools, low crime rates, and the availability of cultural events also factor into lifestyle considerations. Due largely to the small number of additional employees generated and the wide geographic area involved, CAT III development would have little effect on schools or crime rates.

Unlike the TOV, some communities in the region have been in existence since early in the 1900s. Over this period, strong family, ethnic, and cultural ties have evolved in places like Minturn, Red Cliff, and Leadville. Changing employment opportunities, escalating real estate prices, and influxes of new residents have challenged these communities and their traditional lifestyles. This trend shows little sign of moderating. Development of the CAT III area would contribute, but in a minor way.

The potential socioeconomic impacts of the expansion must be assessed in the context of the region as a whole. The Vail region is subject to the same “boom in mountain living” as other West Slope mountain communities in Colorado and other popular mountain areas in the West. In this setting, resident, part-year resident, and tourist numbers are expanding rapidly. In light of the relatively small number of people associated with the proposed CAT III development, their potential contribution to these impacts is small. The question here is whether the proposed CAT III area expansion, when viewed in this larger context of development in the region, would result in some critical threshold being surpassed, causing a significant socioeconomic impact. While any conclusion in this regard is somewhat speculative, given the minor increment of added impact and the apparent ability of the communities involved to deal with such impacts, no significant impact is likely.

2.5.2.3.6 Transportation and Parking

Parking and transportation were two of the primary issues identified and addressed in the 1986 EA/DN on the Vail Ski Area Expansion. The 19,900 SAOT manage-to capacity was derived in part from concerns about level of service and related parking problems experienced on peak days. Traffic and parking problems in Vail are being managed and reduced through a variety of targeted actions, and VA has completed parking and transportation mitigation measures prescribed in the 1986 DN. Traffic congestion problems at the main Vail interchange and associated intersection should be greatly improved now that the traffic roundabout is completed, and improvements to the West Vail interchange are under consideration. Vail is served by an efficient intercity public transit system that links the Vail Village core to East Vail and West Vail; as well as a regional transportation system linking Leadville, Avon, Beaver Creek Resort, Edwards, Eagle, and Gypsum. Except for a few days each year, parking is adequate in the TOV, and developers are required to provide adequate parking.

Except for a few days each year, parking is adequate in the TOV, and developers are required to provide adequate parking. In 1986, there were 2,337 public parking spaces in the TOV-- today there are 2,750 public spaces. According to the TOV, during the 1994-95 ski season, the two major public parking structures in the town were never simultaneously filled. For a variety of reasons, there has generally been a trend away from peak-day parking problems over at least the last few ski seasons.

The Agreement (TOV/VA 1995) is important to understanding the current transportation and parking situation in Vail, because it affirms the TOV/VA commitment to improving transportation and parking, and prescribes specific actions to be undertaken. In affirming the manage-to program, the agreement includes provisions for a monitoring program and continuation of joint efforts, such as the Parking Task Force. The TOV has indicated its support of development of the CAT III area and has stated, “that the scope of the Forest Service’s environmental review need not focus on the off-site issues related to the TOV since they have been previously

identified, studied and discussed through the public process and since this agreement will ensure that growth management processes established herein are followed.”

Reasonably foreseeable future actions that could affect transportation and parking in the Vail Valley include the continued population growth of the area, and increasing year-round recreation in the Vail area. The TOV is rapidly approaching full buildout of land zoned for development and the availability of land for development is decreasing correspondingly. These problems could largely be offset by building a transportation and parking system adequate to cope with peak skiing demand, although some of the remaining margin for improvement of traffic and parking in Vail is probably limited to refinements of systems and programs already in place. Currently, these appear adequate, provided that there is no significant increase in peak-day visitation.

2.5.2.3.7 Visual Resources

The CAT III area lies within a nearly closed basin and cannot be seen from any town, residence, or highway. At distances ranging from five, to more than ten miles away, upper portions of the PA may be visible from very high elevations. However, it is unlikely any CAT III ski facilities could be discerned from that distance. Implementation of any of the action alternatives would be consistent with the adopted Visual Quality Objective for the area, which is *modification*. Within the Back Bowls, the ridgeline Vail Mountain and upper portions of Sleepytime Road would provide the most encompassing views of the development.

Views along the Two Elk Trail are, in large part, obscured by topography and little of development within most of the major bowls would be visible. However, under the MDP Alternative, development in lower Command Bowl would be visible from this trail. Immediately along Two Elk Trail, skiway/roads, bridges, and lift terminals would be installed and would be very apparent to trail users. From this perspective, the impacts of the Center Ridge or Proposed Action Alternatives would be similar, though the later includes a restaurant and additional bridge. The MDP Alternative would extend development to Lower Sun Down Bowl and would consequently be of greater visual impact. Views from the Commando Run Trail of potential development in the CAT III area are also affected by topography and vegetation. Along the southeastern periphery of the PA, this trail extends through dense spruce-fir forest offering only limited views of Commando Bowl. It is not until the trail ascends Mongolia Bowl in the developed ski area that it provides extensive views of the potential development in the CAT III area. From this vantage point, much of Commando and East Pete's bowls are visible. However, little or none the development which could occur in Pete's and Super bowls, or Super Bowl West would be visible from Mongolia Bowl. In this regard also, the MDP Alternative is of greater impact to visual resources than either of the other action alternatives.

2.5.2.3.8 Timber Resources

In accordance with Forest Service policy, ski area permittees are charged fair market value for trees which are cleared for ski trails, roads, and other facilities. The CAT III area contains a relatively large amount of timber with commercial value. Approximately 38 million board-feet of sawlogs and 9 million board-feet of products other than logs are located in the CAT III area. The timber types are predominately lodgepole pine, Engelmann spruce, and subalpine fir. The analysis presented in the EIS does not include an economic analysis of the various timber harvesting methods. Some of these methods are not commonly used in Colorado, due in part, to higher costs. It should also be noted that the effects of not utilizing the timber translate into air quality impacts due to burning. These potential impacts are outlined under Air Quality above.

The EIS considers several different levels or *methods* of timber harvest, along with three different routes, or *options* of removing the timber from the area. The three harvest methods, together with the incremental impacts associated with each are described below.

Method 1 would utilize conventional, ground-based skidding. VA would be required to pay for all merchantable material that would be cut on slopes less than 40 percent and within 1,000 feet of a road or skiway. All timber would be disposed of on site either by burning or by being used in the construction of ancillary facilities. Burning is the one of the more frequently used disposal methods in current trail-clearing projects at Vail Ski Area, since commercial markets are not always available and due to ski area operational conflicts. As a common technique, the impacts to the physical, biologic, and human environment are incorporated into the discussion under the various resource headings above. The description for *Methods 2* and *3* below use this method for a basis of comparison of impacts.

Method 2 would be the same as above, except that all timber cut on slopes less than 40 percent and within 1,000 feet of a road or skiway would be removed for commercial use rather than burned. Though the location of skid trails could change somewhat, the general level and intensity of impacts to geology, soil, and water resources and the biologic environment (wildlife, vegetation, biodiversity, etc.) would remain essentially the same as under Harvest *Method 1*. Also there would be no difference with respect to noise related to the project, compared to Harvest *Method 1*. Potential impacts to recreation would increase, however, since timber would be hauled from the CAT III area for transport to a sawmill. These impacts are described later in this section.

Method 3 would utilize one, or a combination of techniques designed to optimize commercial utilization of the timber. This could involve cable (skyline), log forwarding and feller-buncher, and helicopter yarding systems, or equipment. The permittee would be required to pay for all merchantable material removed from the area and the timber would be made available for commercial use. The timber harvest systems and methods that would be employed under this method would greatly reduce the amount of ground disturbance. Consequently, impacts to geology, soil, and water resources would be substantially reduced compared to other harvest methods. All of these more advanced timber harvest systems would disturb less ground vegetation than conventional systems. Cable logging systems would not vary measurably in the type and intensity of other impacts on the biologic environment, compared to other harvest techniques. Feller-buncher operations would tend to leave a mat of slash, which would create more favorable habitat for small mammals than conditions associated with conventional skidding. Helicopter yarding, while reducing ground disturbance, could extend the zone of disturbance because of increased noise. However, because of its efficiency, its period of operation could be shorter. Helicopter yarding would detract somewhat from the quality of the recreation experience for hikers and mountain bikers on Two Elk and the Commando Run trails during timber harvest operations. As long as operations were restricted to July and August, helicopter yarding would not seriously affect big game hunting opportunities in the area. The impact of other timber harvest systems, such as log forwarding and skyline, would differ little with other harvest methods in the way in which the human environment in the area would be affected.

Three timber haul *options* are considered in the EIS and are described below.

Under *Option 1*, timber would be hauled from the CAT III area, through the Back Bowls, and down the front side on the existing road system. This would involve use of the Transmontane/Mill Creek route and enter I-70 via Vail Road. This option would utilize roads and skiways that would be built for the CAT III area ski facilities, existing roads within the Back Bowls, and those on the front side of the Vail Ski Area to remove merchantable timber. Because of this, additional impacts to slope stability, soil erosion, and water quality would be minimal assuming routine maintenance continues. However, noise associated with logging truck traffic would present

some concerns. The number of logging truck round trips required to remove merchantable timber with *Option 2* is as follows: 1) No Action Alternative—none, 2) Center Ridge Alternative—90 trips, 3) Proposed Action—212 trips, and 4) MDP Alternative—221 trips. The trips would be spread over three to seven years. Accordingly, trucks would make from 30 to 40 trips per year.

The primary impacts of this route would be to recreationists on the front side of Vail Ski Area and for some residents along Vail Road who may find the increased truck traffic and noise from hauling logs unpleasant. The fact that various village construction projects have been in progress for several years has created somewhat of a “construction zone” in some areas and this may add to the frustration for some.

Option 2 involves construction of about 2.4 miles of temporary road, that would link the CAT III area with the Vail Pass/Shrine Pass Road system via Lime Creek. The impacts on the recreation and land use that would be associated with development of a temporary Lime Creek haul route are included in the discussion of the MDP Alternative. The Lime Creek haul route would be obliterated and made impassable after its use but is a concern because of its potential to increase access to the CAT III area. It should be noted that the *Option 2* haul route could also be applied to Alternative C, though this is not a part of the Proposed Action.

Option 3 would involve helicopter transport of logs from the CAT III area to one of several locations. Logs removed from the CAT III area would be airlifted to a staging area on the Lime Creek Road, the Timber Creek Road, or Two Elk Trailhead near Minturn. There would be no incremental impacts on physical resources associated with this option. Using a helicopter, logs would be flown to a central staging area along an existing road. From there, they would be loaded on trucks for transport to a sawmill. This method of timber transport would tend to have little or no incremental effect on vegetation or aquatic resources. From the point of view of reducing habitat fragmentation, eliminating the need for a Lime Creek timber haul road would be beneficial. There could be some minor disturbances to wildlife resulting from increased helicopter use in the area during construction, but this would tend to be of shorter duration than other haul options. Air transport of logs would create disruptions for summer visitors in and around the PA under this option. Both the Two Elk and Commando Run trails receive at least moderate levels of use from July through September each year. Helicopter traffic would detract from the quality of the recreation experience for hikers and mountain bikers in the area. Some periodic closures of trails along the flight path may be required for safety. Of the three potential staging areas and routes, flying the logs to the Two Elk Trailhead probably presents the greatest level of impacts on recreationists because the route so closely follows the trail itself. Conversely, an air route from the CAT III area to a Lime Creek staging area would likely present the fewest recreation conflicts, but would likely create more wildlife-related disturbance.

The lands within the Vail Ski Area SUP boundary are included in the suitable timber base for the WRNF and consequently are factored into the allowable sale quantity (ASQ). Because of that, any commercial timber made available from the CAT III area would reduce the amount of timber that might be offered for sale or cut on some other portion of the WRNF in any given year.

No new timber sales are currently planned within the LA, regardless of whether or not the CAT III area development proceeds. The Timber Creek timber sale was previously being considered for harvest. It was withdrawn from consideration in order to preserve options and allow for the gathering of new information. It could be considered at some point in the future, depending on environmental and other considerations at the time.

2.5.3 POTENTIAL MITIGATION MEASURES

Mitigation measures are employed to avoid or reduce impacts. There are five sequential levels of mitigation. The first is avoiding the impact (e.g., designing a road to avoid a wetland). If an impact cannot be avoided, the next consideration is to minimize the impact (e.g., align a road to impact wetlands the least). If an impact cannot be avoided and significant impacts occur, actions to rectify the impact can be considered (e.g., restoring or rehabilitating a wetland following construction). Another possibility in such a case is to reduce or eliminate the impact over time (e.g., allow the wetland to recover from impacts). Finally, if an impact cannot be avoided, minimized, rectified, or reduced over time, compensation for the impact can be considered (e.g., creating new wetlands to compensate for the wetlands lost to development).

There are a number of conditions, laws, requirements, stipulations, and management guidelines and practices already in place that would function to reduce the level of impact if the decision to proceed with implementation of the project were given. Therefore, application of these measures can be considered mitigation. For the purposes of the analyses in the EIS, these existing mitigation measures collectively are called "Standard Measures." These measures include a wide variety of legal, regulatory, administrative, and adopted procedures and processes. For the purposes of the EIS they have been categorized into four groups: Legal, Policy, and Regulation; Best Management Practices (BMP); Forest Plan Requirements; and General Project Design. Measures in these four groups can require or specify mitigation of a potential impact individually, as a group, or collectively. An important assumption in the impact analysis of this proposed project is that the Standard Measures will be applied as appropriate to reduce the level of impact associated with implementation of an alternative or element of an alternative. A short description of each of the four categories is presented below.

Legal, Policy, and Regulation. The Forest Service and other agencies stipulate specific mitigation measures for certain development actions. The SUP issued by the Forest Service in 1986 to VA states the following: "The holder, in exercising the privileges granted by this term permit, shall comply with all present and future regulations of the Secretary of Agriculture and federal laws; and all present and future, state, county, and municipal laws; and regulations which are applicable to the area or operations covered by this permit to the extent they are not in conflict with federal law, policy, or regulation." Various Forest Service handbooks contain practices for protection of natural resources. The proposed project will need to follow those practices once they are in place. Provisions of the Agreement would apply as Standard Measures.

Best Management Practices. BMPs comprise specific timing directives and required actions aimed at mitigating impacts. BMPs are included in the Operating and Construction plans and VA's Stormwater Management Plan. Operating and Construction plans are developed jointly by VA and the Forest Service and are revised annually. They contain specific requirements for conducting most ski area development and construction activities, and have proven generally effective over time. For example, construction and grading can be scheduled to minimize soil exposure during periods of snowmelt or rain. Ground-based logging operations can be avoided or minimized on sensitive soils, in wetlands, or in riparian areas. Construction practices can minimize the length, gradient, and velocities of runoff from disturbed areas. Staked straw bales, filter fences, or sand bags can be used in all disturbed areas within 100 feet of streams and channels to trap sediment. Whenever feasible, roads and skiways can be outslopped to minimize erosion and reduce the risk of failure of drainage structures. BMPs will apply to all development actions in the PA for the EIS. VA is also required to have in place an approved Storm Water Management Plan for activities that involve grading, excavation, or vegetation removal or have the potential to introduce chemicals or other materials to surface water. This plan is reviewed and updated annually by the Colorado Department of Health. The Storm Water Management Plan itself contains a separate list of Best

Management Practices for materials management, spill prevention, and erosion and sediment control. An example of inclusion of Standard Measures would be that unless specified otherwise, all mitigation measures previously developed for the Vail Ski Area will be required for the CAT III area.

Forest Plan Requirements. The Vail Ski Area operates under a set of broad standards designed to reduce resource impacts. Forest Plan standards, guidelines, management directions, and the Forest Plan management area prescriptions provide a starting point for all mitigation efforts in the Vail Ski Area. In addition, specific mitigation measures were developed for the Vail Ski Area as part of the 1986 EA and 1986 DN.

General Project Design. The mitigation measures of avoidance and minimization were considered to varying degrees in the design of the Proposed Action and Center Ridge alternatives. Specifically, impacts to wetlands, old-growth forest, and riparian areas were important considerations in the alignment of roads, skiways, ski trails, and ski lifts and for the placement of lift towers and terminals.

In addition to the Standard Measures, there are a number of potential project-specific mitigation measures that could also reduce or eliminate potential impacts. These measures are noted by discipline in Table 3.2 below. It should be noted that the measures listed here are not necessarily compatible, and could in some cases conflict. However, they present a range of mitigation options. The total mitigation plan for this project would include both the standard and project-specific measures. Should an action alternative be selected, the actual measures required by the Forest Service would be specified in the ROD.

Table 2.11. Potential Impacts and Mitigation Measures.				
PHYSICAL ENVIRONMENT				
Geology, Soils, Hydrology				
Code	Potential Impacts	Project-specific Mitigation	Effectiveness	Who
GO1	Increased risk of mass movement on geologic hazard areas	Perform a geo-technical evaluation prior to construction on critical areas.	2	VA
SO1	Increased erosion from grading and excavations	◆ Outslope of Intertie skiway/road and other skiways roads	2	VA
		◆ Placing a double bale silt fence barrier below the Intertie skiway/road	2	VA
		◆ Design input from ACOE including a specific water quality protection system	2	VA/ ACOE
HY1	Increased stream flow in Two Elk Creek due to clearing of forest leading to stream instability	None Applicable	N.A.	N.A.
HY2	Increased sedimentation in Two Elk Creek due to construction activities	◆ Outsloping, using double straw bales/geo-cloth, and culvert, and armoring inlets and outlets	2	VA
		◆ Stage construction such that no development would occur on adjacent drainage until revegetation standards are met on previously disturbed sites	2	VA
		◆ Limit soil-disturbing activities during periods of heavy rain and wet soil	2	VA

Code	Potential Impacts	Project-specific Mitigation	Effectiveness	Who
HY2 (cont)		◆ Rip compacted soils around high use areas prior to construction	3	VA
HY3	Potential chemical contamination of streams from heavy equipment	◆ Enforce refueling requirement of 100 ft. from water	2	VA
HY4	Increased erosion and increasing sediment into Two Elk Creek (post construction)	◆ Installation of filter fence below terminals along Two Elk Creek	2	VA
		◆ As necessary, build retaining walls on slopes steeper than 50 % , especially near riparian areas, channels etc.	2	VA
		◆ Outslope roads wherever possible	2	VA
		◆ Flush cut instead of grubbing stumps, where possible	2	VA
		◆ Deposit slash at the toe of fills	3	VA
		◆ Keep sediment traps into the slope, and clean when 80 % full	3	VA
Air Quality				
AQ1	Increased PM ₁₀ from burning timber and vehicle dust in the CAT III area	◆ Meet requirements of the Burn Plan	1	VA
		◆ Commercially utilize instead of burning timber	2	VA
		◆ Burn relatively dust-free and uncompacted piles of slash and minimize burning of stumps	2	VA
		◆ Burn early in the day to minimize smoldering	2	VA
		◆ Burn on relatively clear and dry days	2	VA
		◆ Gravel major on-mountain access roads	2	VA
AQ2	Increased vehicle emissions	◆ Encourage mass transit use	3	VA
Noise				
NO1	Noise disturbance from construction and timber harvest	◆ Avoid construction during elk calving season	2	VA
		◆ Limit work to daytime hours	2	VA
		◆ Implement phased development	2	VA
		◆ Appropriately muffle heavy equipment	3	VA
NO2	Noise disturbance from normal operations	◆ Operate only during daytime hours	2	VA
		◆ Appropriately muffle heavy equipment	3	VA
BIOLOGICAL ENVIRONMENT				
Aquatic Biology				
AB1	Increased sedimentation in Two Elk Creek due to construction and timber harvest	◆ Limit activity in stream side zones to May 1 to October 1	2	VA
		◆ See also SO1 and HY2		
AB2	Increased sedimentation in Two Elk Creek due to normal operations	◆ Mark trails, bike paths, and picnic areas near riparian areas	2	VA
		◆ Post sensitive areas to control use	2	VA

Code	Potential Impacts	Project-specific Mitigation	Effectiveness	Who
Vegetation				
VE1	Loss of forest habitat	♦ Minimize conventional runs in favor of glading, and keep tree removal in gladed areas to the lowest level feasible	2	VA
VE2	Loss of habitat	♦ Be highly selective in choosing forest canopies to be opened	2	VA
		♦ Use limbing techniques when possible	2	VA
VE3	Increased risk of non-native weed introduction	♦ Immediately revegetate disturbed areas	2	VA
		♦ Use only weed-free mulch	2	VA
		♦ Rapidly respond to weed introductions	3	VA
VE4	Loss of old-growth	♦ Minimize clearing in designated old-growth areas	1	VA
VE5	Encroachment of woody vegetation in avalanche pathways	♦ Periodic cutting of woody vegetation within traditional avalanche chutes to simulate an avalanche	2	VA
VE6	Loss of native flora	♦ Use native plants in revegetation efforts	2	VA
VE7	Loss of sensitive plant species	♦ Pre-construction review of surveyed alignments for sensitive plants	2	VA
Wetlands				
WE1	Dredge and fill and construction disturbances	♦ Conduct a preconstruction inspection after facilities locations have been surveyed.	2	VA
		♦ Have a qualified wetlands specialist present when crossing or disturbing wetlands	2	VA
		♦ Return flow to natural channels where possible	2	VA
		♦ Avoid falling trees into streams, channels or wetlands	2	VA
		♦ Use geotextiles, jute or other control measures to control erosion and sedimentation.	2	VA
WE2	Loss of functional values in riparian area due to vegetation trimming	♦ Define appropriate skier crossings of willow communities that would avoid or minimize impacts	2	VA/FS
		♦ Limit trimming of wetland/riparian vegetation to within 18 inches of the surface	2	VA
Wildlife				
WL1	Loss of standing-dead trees (snags) and forest debris habitat elements	♦ Reduce the amount of conventional ski trails	2	FS/VA
		♦ Scatter slash generated from the cutting of new ski trails in and around the edges of remaining forest islands according to WRNF Forest Plan	1	VA
		♦ Scatter slash in conventional ski trails, not to exceed 12" in height for spruce-fir and 10" in height for lodgepole pine and aspen to enhance habitat connectivity	2	VA

Code	Potential Impacts	Project-specific Mitigation	Effectiveness	Who
WL2	Displacement of wildlife, particularly forest-interior and edge-sensitive species, from critical habitat areas	◆ Limit construction season to <u>after</u> June 30	1	FS/VA
		◆ Phase construction of lift pods to slow the rate of habitat conversion over the seven-year construction period	2	VA
		◆ Apply specific lynx management guidelines to specific trail layout especially in minimizing development of areas with heavy down timber, rocky areas and identified snowshoe hare habitat	2	VA/FS
		◆ As necessary, implement trapping restrictions in the La to avoid incidental taking of lynx	2	FS
WL3	Disturbance to wildlife from spring through fall	◆ Manage summer recreation to minimize disturbance <u>before</u> July 1	1	FS/VA
		◆ Limit organized recreation activities, especially mountain biking, to designated roads and trails in the CAT III and III areas	2	FS/VA
		◆ Contour temporary construction/timber harvest roads to near original slope	3	VA
		◆ Conduct an information/education program explaining construction activities and schedules and temporary restrictions; including a brochure detailing summer ecology of the ski area and tips on outdoor ethics	3	FS/VA
		◆ Install signs encouraging the public to stay on trails	3	FS/VA/ CDOW
WL4	Loss of big game habitat	◆ Leave large, undisturbed forest islands in close proximity to gladed and cut-over sites	1	FS/VA
		◆ Minimize disturbance of areas with special habitat elements such as wallows, licks, and especially calving/fawning habitat	1	VA
		◆ Develop gladed ski trails, rather than conventional trails, when traversing elk calving habitat	2	V
		◆ Stabilize and seed ski trails, lift-line corridors, and glade sites with preferred native forage for elk, mule deer, and black bear	2	VA
		◆ Scatter slash generated from the cutting of new ski trails in and around the edges of remaining forest islands	3	VA
		◆ See WL3		
WL5	General disturbance to and displacement of big game	◆ Phase construction of lift pods ◆ See WL3 and WL6	2	FS/VA
WL6	Disturbance to elk during calving season	◆ Maintain of China Bowl from May 1 through June 30 for elk calving	1	FS/VA
WL7	Nuisance bear hazard	◆ Tightly control all food, waste, and other garbage associated with restaurants/picnic decks so that it will not become available to bears	1	FS/VA

Code	Potential Impacts	Project-specific Mitigation	Effectiveness	Who
WL7 (cont)		♦ Train employees in the proper management of restaurant wastes	2	VA
		♦ Construct, install, and maintain interpretive signs at trail heads and on trails near areas frequently used by bears	3	VA
WL8	Off-site impacts associated with increased real estate development	♦ Zone accordingly for maintenance of open space in areas with migration corridors, winter range sites, and sensitive habitats	1	Eagle CO/ TOV/VA / land owners
		♦ Require that developers provide for certain types of habitat protection	2	FS/TOV Eagle CO/
		♦ Encourage conservation easements on existing properties to maintain the wildlife values	2	
		♦ Create tax incentives for placement of conservation easements	2	TOV/ Eagle CO
WL9	General impacts to wildlife resulting from ski area expansion and secondary growth	♦ Create a conservation trust fund to be used for on- and off-site wildlife mitigation efforts and habitat restoration and enhancement	2	TOV/VA /CDOW
WL10	Increased access and human intrusion via the Lime Creek Road	♦ Obliterate and recontour road after use	1	FS
		♦ Make road impassable after use with trees, rocks, or brush	1	FS
		♦ Gate road while in place and functioning	2	FS
		♦ Officially close and patrol road during its existence	2	FS
Biodiversity				
BD1	Loss of standing dead trees (snags) and forest debris habitat elements	♦ See WL1	N.A.	FS/VA
BD2	Habitat fragmentation	♦ Reduce the amount of forest area clear-cut for ski trails	1	FS/VA/ CDOW
		♦ Maximize use of natural openings and minimize overstory removal in final ski trail layout	2	VA
		♦ Preserve blocks of habitat during trail design	2	VA
		♦ Delineate and protect wildlife (i.e., elk) migration corridors linking habitat areas	2	FS/VA
		♦ Reduce the overall road density in the LA	3	FS
		♦ Incorporate Forest Service diversity standards and guidelines into the Vail Ski Area MDP-Vegetation Management Plan	3	FS/VA
		♦ Revegetate ski trails and lift-line corridors with native species	2	VA
BD3	Disturbance to specific aquatic sites such as Commando Pond and beaver ponds in Sun Down Bowl	♦ Confine all summer traffic to service roads and well-defined foot paths	2	VA/FS
		♦ Construct, install, and maintain interpretive signs explaining the fragile nature of sites to summer users	3	VA/FS
HUMAN ENVIRONMENT				
Cultural Resources				
CR1	None	♦ None required	N.A.	N.A.

Code	Potential Impacts	Project-specific Mitigation	Effectiveness	Who
Land Use				
LU1	Modifications to summer/fall recreation and livestock use due to construction and timber harvest operations	♦ Modify recreation and livestock grazing patterns to avoid construction hazards and disturbed areas, especially during revegetation efforts	2	FS
Recreation and Alpine Skiing				
RS1	Reduced quality of summer and fall recreation due to construction and timber harvest activities	♦ Phased development ♦ Modify patterns of summer and fall recreation ♦ Post signs noting ongoing construction activities	2 3 3	VA VA VA
RS2	Increased access to the CAT III area from road and skiway development	♦ Post sensitive areas to avoid impacts ♦ See WL10	2	FS/VA
RS3	Increased risk from ski trails crossing avalanche pathways	♦ Align ski trails away from avalanche pathways ♦ Actively control known avalanche hazards within appropriate portions of the SUP	1 2	VA VA
RS4	Access to backcountry areas	♦ Augment Boundary Management Plan and extend existing backcountry skiing precautions to the CAT III area	2	VA
Socioeconomics				
SE1	Demand for affordable housing in Vail	♦ Continue to support low-cost housing in Vail	2	VA/TOV/ Eagle CO. /other employers
Transportation and Parking				
TP1	Parking & Transportation	♦ Encourage optional use of existing transportation services	3	TOV/VA/ Eagle CO.
Visual Resources				
VR1	Change of visual character in the PA	♦ Place lift terminals below ridgelines ♦ Paint permanent structures to blend in with background colors and textures	2 2	VA VA
Timber Resources				
TR1	Increased PM ₁₀ from burning	♦ See AQ1		
TR2	Increased noise from haul operations	♦ Limit hauling to daytime hours ♦ Avoid residential areas	2 2	VA VA
TR3	Increased access to area	♦ See wildlife impacts and measure WL10		
Effectiveness Rating: 1=highly effective; 2=moderately effective; 3=somewhat effective; 4=uncertain. Who: Entity with jurisdiction or authority to implement this action/Entity that could do the work				

2.6**FOREST SERVICE PREFERRED
ALTERNATIVE**

The Preferred Alternative is the Proposed Action, Alternative C. This alternative represents a reasonable balance between meeting the purpose of the Proposed Action and fulfilling other resource objectives. In particular, this alternative would provide more reliable early-season skiing at the Vail Ski Area, help the Forest Service accomplish its mission of offering high-quality recreation experiences, and minimize adverse impacts to important natural resources.

This Draft EIS does not contain a preferred option for timber harvest methods or haul routes that could be needed to utilize timber cleared for trails, skiways, roads, and other CAT III area facilities. However, the analysis in this document does include the incremental environmental impacts that could result from implementing various methods to commercially utilize the timber. Conditions regarding timber utilization and haul routes will be identified in the ROD.

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CHAPTER 3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter is the baseline description of the existing environment in terms of the physical, biological, and human resources, and conditions which may be affected by the Proposed Action and alternatives to it. The description is structured by resource/discipline. The purpose of Chapter 3 is to describe the environment of the area(s) to be affected by the alternatives under consideration. CEQ regulations direct agencies to succinctly describe the environment that could be affected commensurate with the importance of the impacts (40 CFR 1502.15). The topics are discussed in the same order in chapters 3 and 4 in order to provide straight-forward comparisons.

The PA for this EIS includes all of the CAT III area, Tea Cup Bowl, and another small portion of the CAT II area along Two Elk Creek. For vegetation, wildlife, and biodiversity, this EIS also incorporates two broader levels of information and analysis. These areas are referred to as the landscape and regional areas, LA and RA, respectively and are first depicted on MAPs 5 and 6.

3.2 PHYSICAL ENVIRONMENT

3.2.1 GEOLOGY

The following description of geologic conditions in the CAT III area is based on the Engineering Geology and Geologic Hazards Evaluation of the CAT III area prepared for WRNF and VA by Goolsby Brothers and Associates, Inc. (1993). This study was based on field mapping studies combined with aerial photo-geologic mapping, a review of existing literature, and previous reports.

3.2.1.1 Geologic Setting

The Vail CAT III area lies on the north slope of Battle Mountain, which is situated in a structural trough stretching from Vail Pass to McCoy in north-central Eagle County. Bedrock within this trough consists of the Minturn formation which originated during the Pennsylvanian period 290 to 330 million years ago. The bulk of the formation consists of interfingering lens-shaped or lenticular beds of sandstone, siltstone, shale, conglomerate, limestone, and dolomite.

Sediments comprising this formation were likely deposited by rivers and streams flowing westward from the ancestral Rocky Mountains toward a narrow seaway which bordered this region in Pennsylvanian time. The seaway was gradually filled with sands, shales, and conglomerates as erosion of the ancestral Rockies continued through geologic time. Periodic rises of the sea, or reductions in sediment deposition rates, caused marine limestone beds to be deposited within the fragments of pre-existing rocks derived from terrestrial sediments of the trough. Deposition of younger sedimentary formations above the Minturn formation continued throughout the remainder of the Paleozoic and most of Mesozoic time, approximately 66 to 290 million years ago.

By the close of the Cretaceous period, a renewed period of episodic regional uplifting began along many of the old existing fault lines of the ancestral Rockies. This uplift elevated the area and allowed a period of intensive erosion to begin. In eastern Eagle County, the Minturn formation rocks are flanked by the Gore Range Uplift to the north and by the Sawatch Range Uplift to the southwest. Structural deformation and faulting during periods of tectonic uplift have heaved and tilted the Minturn strata so that the strike and dip of bedding varies widely in the Eagle County area. On Battle Mountain, the Minturn dips gently north-northeast at 3 to 5 degrees.

Relative to seismic considerations, the general area around the CAT III area is structurally defined by the inactive Spraddle Creek fault zone and a series of synclines. The Spraddle Creek fault zone extends in a southwest direction from the Gore Creek fault zone north of I-70, through Vail Mountain, and terminates east of Gilman. These conditions are typical for mountainous areas in central Colorado. Seismic activity is mostly associated with Laramide-age uplifts (Algermissen et al. 1982), however, historical accounts of earthquake activity in the Vail area do exist.

At present, erosion is still very active in the region. All the sedimentary rock overlying the Minturn formation, and much of the upper part of the Minturn itself, has been stripped away in the last few million years. Exposures of the Minturn formation in eastern Eagle County are typically marked by steep slopes and cliffs. Examples include the canyons and cliff areas along upper portions of the Eagle River and Gore and Two Elk creeks. Erosion and mass-wasting processes continue to operate on a geologic time scale.

Geologic processes have resulted in the creation of several different landforms within the PA. Landforms present in the CAT III area include stream alluvium, terrace alluvium, debris fan deposits, landslide deposits, colluvial slope-failure complexes, bedrock dip-slope failure complexes, thick colluvial slope and foot-slope wedge deposits, thin colluvium and slope wash, talus and rockfall boulders, and the residual slopes of the Minturn formation.

3.2.1.2 Geologic Hazards and Constraints

The CAT III area is comprised of three main classes of geologic or slope stability considerations. Figure 3.1 depicts the location of these areas, while Table 3.1 provides a description of the units which are represented on this map. Geologic hazards are areas that should be either avoided, or merit detailed geotechnical studies prior to allowing construction. Geologic hazards within the CAT III area include rockfalls, unstable slopes, debris, slide-prone fans, and ravines. Geologic constraints are areas where facilities can generally be constructed without significantly affecting slope stability. Geologic constraints within the CAT III area include potentially unstable slopes underlain by old landslide deposits, or colluvium of the Minturn Formation. Geologic constraints are relatively common in mountainous regions, and nearly all of the facilities on the front side of the Vail Ski Area are located on the areas of potentially unstable slopes. The third category of geologic consideration includes areas with no known slope stability concerns. These are relatively gently sloping ridgetops and are indicated on Figure 3.1 as "Non-Hazard areas."

During much of the Quaternary period of the last 2 million years, nival conditions (heavy, lingering snow cover but no glaciers) have existed in the Battle Mountain area. These high levels of precipitation have resulted in increased soil moisture and groundwater levels. Frost action and nival processes acting on the ridges and slopes of Battle Mountain have accelerated weathering and erosion of the rock strata and contributed ultimately to large-scale mass wasting of the terrain. Landslide-earthflow and bedrock block-slide complexes have occurred along first-order streams on the steep side-slopes of the CAT III area, leaving large bowl-shaped scars floored with landslide deposits.

Geological Hazards/Constraints Key:

HAZARDS:

- US - Unstable Slopes
- DMA - Debris Flow - Mudflow Deposition Area
- DSA - Debris Slide & Debris Avalanche Prone Slopes
- RF - Rockfall Area
- Contact (dashed where approx. located)
- Localized Debris Slide-Prone Ravines
- Bedrock Block-Slide Detachment Zones and Slide Scarps

CONSTRAINT:

- PUS - Potentially Unstable Slopes

-Two Elk Creek
& other drainages

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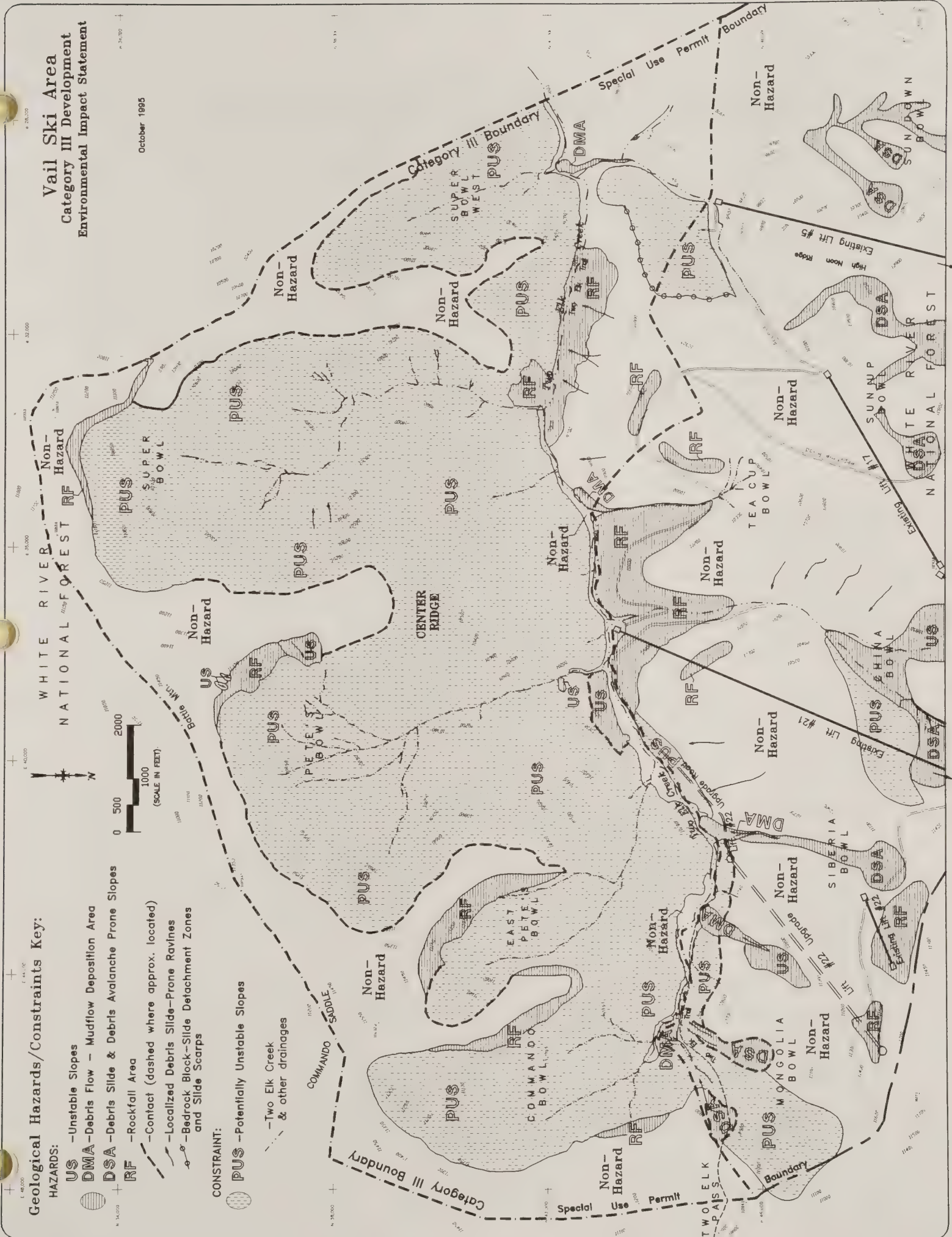


Figure 3.1. Geologic hazards & constraints within the upper Two Elk Creek watershed.

Table 3.1. Geologic hazards and constraints within the PA

<i>Hazard</i>	
Unstable slopes (US)	These comprise oversteepened slopes on the west wall of Pete's Bowl and local areas of recent landslide deposits. These sites exhibit evidence of active creep and show related features such as tension cracks, fresh scarps, and recent slide deposits. The stability of these areas is greatest during the winter while slopes are frozen under snow pack, and lowest during spring runoff.
Debris flow-mudflow deposition areas (DMA)	Several fan-shaped deposits of debris occur along Two Elk Creek at its confluence with steep tributary side valleys. Boulders, mud, and debris derived from flash floods and debris slides from steep slopes along the tributary valley walls are periodically deposited on the fan surfaces. The processes forming the fans are still active; deposition of mudflows and debris flows can occur naturally in DMA areas. They should be avoided as sites for any critical or permanent structures, unless site-specific studies are conducted to determine the nature and extent of hazard areas, and mitigation measures are developed.
Debris slide and debris avalanche prone slopes (DSA)	These slopes are comprised of thin colluvial deposits in small bowl-like areas on steep slopes above narrow ravines that can detach from the underlying slope and slide down the ravines forming a viscous, rocky slurry which travels rapidly to the base of the slope. Slide occurrences are most often related to conditions which cause surcharges of moisture and groundwater along the colluvium-bedrock interface on steep, sparsely vegetated slopes. Most debris slides occur during heavy, rapid spring snowmelt, or in association with prolonged, intense rainfall.
Rock fall areas (RF)	Rock falls are associated with steep, nearly vertical cliffs and outcrops of the more resistant rock types within the Minturn formation. They are of limited extent and, if avoided for placement of critical facilities, should not pose significant problems.
<i>Constraint</i>	
Potentially unstable slopes (PUS)	Potentially unstable slopes occur in areas of landslide terrain and thick colluvium. These slopes differ from active areas of landslide and slope creep in that, rather than mass-wasting being an ongoing process, it is a dormant one. Such slopes are in a state of metastable equilibrium, where slope failures can be initiated by a change in either natural (e.g., precipitation, increased soil moisture, adjacent slope creep) or anthropogenic (e.g., road cuts, addition of moisture through irrigation, improper drainage) conditions.
Source: Goolsby Brothers and Associates, Inc. 1993	

The Minturn formation outcrop is characterized by landslides and slope failures throughout much of its exposure in Eagle County. The weak and platy rocks of the Minturn formation readily form a heavy, failure-prone wash or colluvium, which creeps downslope and forms thick deposits along valleys and footslopes. The many soft and crumbly shale beds within the Minturn strata provide ideal surfaces for block-glide landslides where the beds dip toward valleys. In addition, the shale intervals are relatively impermeable, forming perched water tables which contribute to slope and rock mass instability. The nature of most sandstone beds limit their ability to strengthen and tie the rock mass together.

These factors combine to make landslides common within areas underlain by the Minturn formation, particularly where steep valleys have been cut into the formation. Larger slides are mostly of the dip-slope, block-glide type. Most conspicuous slides are post-glacial (15,000 years before present), and some are recent or presently active. Almost all of the large slides still have some potential for future movement, as indicated by topography and favorable geologic characteristics.

Smaller landslides and debris slides are generally localized failures of the heavy slope debris which mantles much of the Minturn formation. Debris slides are fairly common along first-order gullies and ravines on steep slopes.

They periodically occur whenever moisture and groundwater conditions reach a threshold where the colluvium becomes locally saturated to the point of failure. The last regional episode of these types of failures was during the spring of 1984, but they can occur locally almost any time of the year except winter. It is not possible to accurately predict where or when such potentially unstable slopes might experience landsliding, slope creep, or debris slides. Geologic analysis and mapping can, however, define areas where topography and geologic conditions combine to make specific, potentially unstable areas more susceptible to landslides and slope failures than other areas. As is the case in most mountainous regions, nearly all slopes in the CAT III area have some potential for mass movement under certain conditions. While these areas are not currently subject to slope instability, changes in soil moisture level, adjacent slope movement, or disturbances by humans can change this condition. These areas are designated on the geologic constraints map as Potentially Unstable Slopes (PUS). PUS areas should not be considered major limitations to ski facilities provided that normal engineering design and routine precautions are taken during construction and operation. Areas of PUS are prevalent across the CAT I and CAT II areas of Vail Mountain with a majority of the existing terminals in these areas located on potentially unstable slopes. Building ski facilities or other structures on potentially unstable slopes within the Rocky Mountains is not uncommon, nor has it been determined an unsafe practice.

3.2.1.3 Mineral Resources

Mineral resources in the Battle Mountain/Vail Mountain area are limited and their development potential is low (USDA-FS 1994a; Goolsby Brothers and Associates, Inc. 1993). There are no deposits of any aggregate, sand, or gravels, and the possibility of economic deposits of metalliferous ores is remote. Some high quality limestone exists in the area, but in thin beds not economically feasible to quarry. No active mining claims are recorded in the CAT III area and the area has been withdrawn from (closed to) mineral development activities in order to protect recreational resources (USDA-FS 1994a). A Decision Notice from the Bureau of Land Management concerning this withdrawal was published in the *Federal Register* (Vol. 60, No. 40: 11045) on March 1, 1995.

3.2.2 SOILS

This section is based on the results of a soil survey conducted for the CAT III area (Walsh and Associates 1993). It has been modified to incorporate the results of an earlier soil inventory for the Vail Ski Area, including the Back Bowls (Walsh and Associates 1985), and adjusted based on the results of field reviews during the 1993 and 1994 field seasons and a Forest-wide soils inventory (USDA-FS 1994 h).

Soils that have been mapped for this project are named for established soil series. However, most of the map units have components (taxonomic units) that are outside the range in characteristics for the soil series for which they are named. Generally, these soils vary due to some characteristic of the soil which would not affect use and management, such as having a slight difference in color, or a horizon (layer) somewhat thicker or thinner than allowable for the established soil series. Typically these soils would be identified at the "family level" (USDA-SCS 1975); however, for convenience this distinction is not included for the soils described below. Finally, because some taxonomic units vary widely in their properties, they have been named for an even broader level in the soil classification system. This type of naming is exemplified by map unit 111, Aquic Cryoborolls -Typic Cryaquolls, 2 to 10 percent slopes.

In order to maintain a closer relationship to the landforms on which the soils occur and the vegetation they support, a relatively large number of map units has been utilized. Consequently, the slope ranges given for a number of these map units overlap considerably.

3.2.2.1 General

Soils of the area have formed from colluvium, alluvium, and residuum of sandstone, limestone, conglomerate, shale, and siltstone of the Minturn Formation. Soils formed in these materials are common over a wide area, including the front side of Vail Mountain (USDA-FS 1994 h). These soils are generally deep (greater than 40 inches) and well-drained. With the exception of Aquic Cryoboralls and Typic Cryaquolls, all of the soils mapped within the CAT III area have greater than 35 percent coarse fragment content (rocks greater than 2 mm in diameter). Having formed in very similar parent materials, soil textures do not vary greatly across the area. Typically, soils within the CAT III area have a loam or sandy loam surface layer, a loam, sandy loam or sandy clay loam subsoil, and a sandy loam substratum. Sandstone or limestone gravel or channers usually are present in sufficient quantities that soils textures are usually described by modifiers such as "very gravelly sandy loam". Within the PA, soil development and distinctions between the soil units mapped is very much related to a given unit's vegetation and landscape position. For example, soils dominated by grassland or aspen vegetation typically have thick, organic matter-rich surface layers. On the other hand, soils formed under dense coniferous vegetation, which normally has a relatively sparse understory, have only thin organic matter-rich surface layers, tend to be much more acidic, and do not exhibit strong development (e.g., discernable layers or structure).

Taxonomic units mapped in the PA include the Bobtail, Eyre, Gateview, Handran, Leadville, Leighcan, Pinesile, Moran, Scout, and Teewinot families. In addition, several broadly defined soils were also identified as components of map units. These include Aquic Cryoboralls, Typic Cryaquolls, Typic Cryochrepts, and Lithic Cryorthents. Soils in the area generally occur in a relatively intricate pattern across the landscape and do not lend themselves to mapping individually. Consequently, most map units are combinations of two or more soils occurring together as a "complexes", such as "Leadville - Handran complex, 30 to 60 percent slopes". Figure 3.2 shows the location of soil map units within the PA.

Under one of the alternatives in this EIS, a temporary timber haul route would be built extending from Commando Saddle to the existing Lime Creek Road system. Soils in the Lime Creek potential road corridor were inventoried as a part of the Forest-wide soil survey (USDA-FS 1994 h) and field checked during the summer of 1994. Similar to the CAT III area and the Lime Creek-Shrine Pass area, Leadville and Scout are the predominant soils within this corridor. These deep, well-drained soils formed in sandstone and limestone residuum and colluvial material of the Minturn formation. Slopes within this corridor range from 10 to 50 percent. The corridor crosses two intermittent streams. At its nearest point, the corridor lies about 200 feet upslope of a small, perennial stream flowing south from Commando Saddle. Soil textures, properties, and management considerations of the corridor are consistent with those listed for other soils within the CAT III area.

Included within the Lime Creek area are several small meadows similar in texture to Leadville soils, but with a dark-colored surface layer about five inches thick. Also included are several small areas of somewhat poorly-drained soils and areas of sandstone rock outcrop.

Soils of the CAT III area can be grouped by the way that they occur on the landscape as soils of: 1) high bedrock ridges and steep mountain sides; 2) young, poorly drained landslide terrains; and 3) stream channels, terraces, and floodplains. General descriptions of the soils occurring in each of these landscape positions are given below.

3.2.2.1.1 Soils of the High Bedrock Ridges and Steep Mountainsides

These soils are located on wind blown ridges and steep mountainsides with rock outcrops and generally show little evidence of soil formation. Under subalpine meadow vegetation, these soils are typically shallow to

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Note:
See Table 3.2 for description of soil types

- - Complex of Wetland & Upland Types
- - Severe Erosion Hazard
- - Revegetation Limitations

- Two Elk Creek
& other drainages

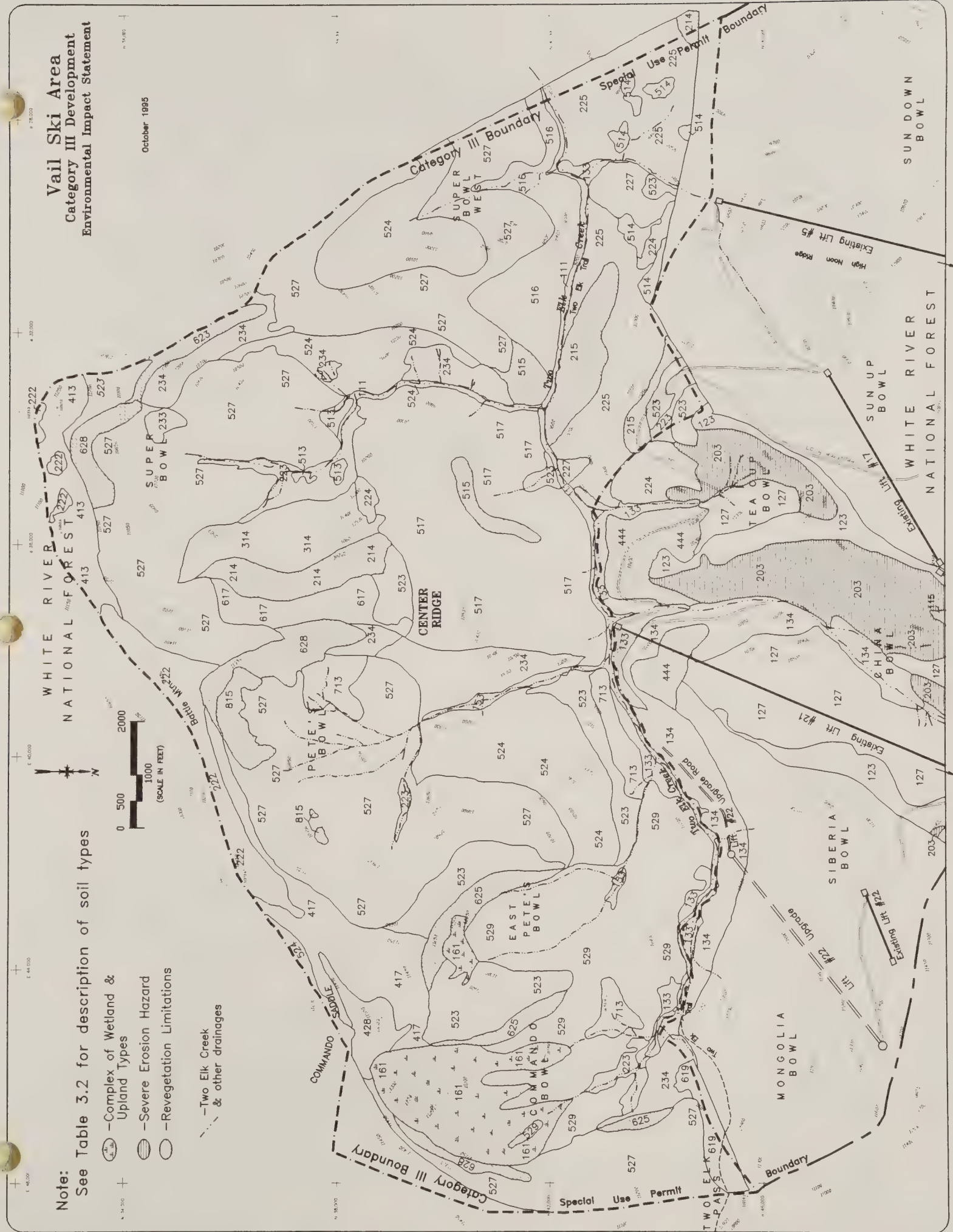


Figure 3.2. Soil Units within the PA.

bedrock, have light colored surface horizons, contain little organic matter, and are represented by Lithic Cryorthents in the PA.

Soils occurring in subalpine meadows and in dense aspen stands typically have a thick, dark colored, base-enriched surface horizon due to the accumulation and decomposition of organic matter in these layers. The increased organic matter lends a relatively high degree of fertility to these soils. These soils occur on high bedrock ridges and saddles and on steep sideslopes and include the Eyre and Handran families.

3.2.2.1.2 Soils of Young Landslide Terrain

These soils formed under mixed forests and meadow vegetation in landslide terrain and colluvium near the lower ends of bowls and on south-facing sideslopes above Two Elk Creek. Under coniferous forests these soils are represented by the Scout and Typic Cryochrept soils. Under aspen vegetation, soils in this landscape position are typified by the Handran, Eyre, Gateview, and Pinesile soils. Finally, in swales and depressions within this unit, poorly drained soils such as Aquic Cryoborolls are found.

3.2.2.1.3 Soils of the Stream Terraces, Channels, and Floodplains

This group includes soils formed in alluvium and colluvium on terraces, lower sideslopes, swales, and floodplains. Soils on terraces and sideslopes are generally deep and well drained and are typified by the Gateview and Handran families. Deep, poorly drained soils such as Aquic Cryoborolls and Typic Cryaquolls are found in swales, in floodplains, and immediately adjacent to stream channels.

Leighcan, Moran, Scout, Leadville, and Teewinot soil families and Typic Cryochrepts are typically found under coniferous forest vegetation on steep mountain side slopes. These soils tend to show some soil development and are generally deep over sandstone or limestone bedrock.

3.2.2.2 Soil Management Characteristics

Soil management characteristics pertinent to ski area development include shrink-swell potential, frost hazard, susceptibility to compaction, soil erodibility, windthrow hazard, and soil fertility. A general discussion of these characteristics appears below.

3.2.2.2.1 Shrink-Swell Potential

Shrink-swell potential refers to a soil's tendency to expand or contract upon wetting and drying. The greater shrink-swell a soil undergoes, the greater the adverse effects on the stability of foundations, roads, and buried tile, utilities, and water lines. In general, the greater the proportion of clays in a given soil the greater the shrink-swell potential it is likely to have. All soils within the CAT III area have moderate shrink-swell potential.

3.2.2.2.2 Frost Hazard Potential

Frost hazard refers to a soil's behavior under freezing and thawing cycles. A soil with a high frost hazard potential expands upon freezing. This expansion can result in frost "heaving" which can cause structural damage to buildings, roads, buried tile, and overhead utility poles and underground lines not buried sufficiently deep. Frost hazard is mainly a function of soil texture, i.e. the relative abundance of sands, clays, and silts. Surface soils of the CAT III area generally exhibit a high frost hazard due to their loamy texture. However, due to an

increased gravel and cobble content in subsurface horizons, the frost hazard is generally moderate below the surface horizon. Consequently, frost hazard limitations for roads and low building foundations is not considered serious throughout the PA.

3.2.2.2.3 Soil Compaction

When soils are compacted, air and water movement and plant root penetration is retarded or stopped. Equipment operations can cause soil compaction and impede revegetation efforts. Surface soil layers were evaluated to assess the potential for soil compaction in the CAT III area. Soils in the PA area generally are moderately susceptible to compaction. The Leadville and Teewinot families, however, show a high level of susceptibility to compaction due to weak surface structure, especially when moist.

3.2.2.2.4 Soil Erodibility

Erodibility refers to the potential for sheet and rill erosion. Important considerations in erosion potential include soil texture, structure, and organic matter content and are the basis for the Erosion Hazard rating in Table 3.2. Though not considered in the ratings, factors such as the content of rock fragments, steepness and length of slope, and vegetative or mulch cover are also very important.

3.2.2.2.5 Windthrow Hazard

Windthrow hazard is the potential for trees to be uprooted by strong winds. Soils of map units occurring on high, unprotected ridges with nearly horizontal bedrock have a high windthrow hazard. Shallow soils such as Teewinot gravelly sandy loam, Eyre sandy loam, and Lithic Cryorthents also tend to have high windthrow hazard. Finally, map units 161 and 713 have poorly drained soils that cause these map units to also be rated as high for windthrow hazard. Most other soils in the PA have a moderate windthrow hazard.

3.2.2.2.6 Soil Fertility

As is used in this EIS, soil fertility includes two main considerations. The first refers to the inherent physical and chemical properties of soils to provide nutrients and water for growth and development of plants. Most of the soils in CAT III have a moderate level of inherent fertility. Soils with a low inherent fertility are the soils shallow to bedrock (or lithic soils), which include Eyre sandy loam, Teewinot gravelly sandy loam, and Lithic Cryorthents. The second fertility consideration relates to the presence of sufficient quantities of macro- and micro-nutrients including: nitrate-nitrogen ($\text{NO}_3\text{-N}$), phosphorous (P), potassium (K), iron (Fe), manganese (Mn), copper (Cu), carbonate ion (CO_3), and bicarbonate ion (HCO_3), all of which are needed for optimal plant growth. Based on laboratory data the soils of the CAT III area are generally low in $\text{NO}_3\text{-N}$ and P, but adequate in K.

Frequently, slope stability is also a soils-related concern. This relates to the potential for landslides, mudflows, slumps, soil creep, etc. However, since a specific geology-geotechnical assessment (Goolsby 1993) was undertaken for this project, slope stability information is addressed above in the Geology section. The soil management considerations presented below do not include interpretations for mass movement potential and the reader is directed to the Geology section for that information.

Using the parameters above, Table 3.2 provides a rating of potential soils limitations related to ski area development activities.

Table 3.2. CAT III Area Soil Management Interpretations (Walsh and Associates 1985; 1993)

Map Unit Symbol	Soil Map Unit	Erosion Hazard	Revegetation Limitations	Unsurfaced Road Limitations	Conventional Ski Trail Limitation
111	Aquic Cryoborolls-Typic Cryaquolls-Alluvium Complex, 2-10 % slopes	Mod	Mod	Unsuitable-w	Unsuitable-w
115	Cryoborolls and Cryochrepts Complex, 0-8 % slopes	Mod	Severe-l,w	Severe-l,w	Severe-r,w
123	Bobtail, 8-25 % slopes	Low	Mod	Slight	Mod
127	Bobtail - Handran Complex, 20-35 % slopes	Mod	Mod	Mod	Mod
133	Gateview - Handran Complex, 8-25 % slopes	Mod	Mod	Mod	Mod
134	Gateview - Handran Complex, 8-50 % slopes	Mod	Mod	Mod	Mod
153	Handran - Alluvium Complex, 8-30 % slopes	Mod	Mod	Mod	Mod
161	Scout - Cryaquolls Complex, 0-35% slopes	Mod	Mod-Severe-w	Severe-w	Severe-w,r
203	Handran - Bobtail Complex, 35-60 % slopes	Severe	Mod	Mod-Severe-s	Severe-e
214	Handran - Eyre - Rock Outcrop Complex, 30-60 % slopes	Mod	Severe-f	Severe-l,s	Severe-r
215	Handran - Eyre - Rock Outcrop Complex, 30-85 % slopes	Mod	Severe-f,s	Unsuitable-s,x	Unsuitable-r,x
222	Handran - Gateview Complex, 5-15 % slopes	Low	Mod	Slight	Mod
223	Handran - Gateview Complex, 8-30 % slopes	Mod	Mod	Mod	Mod
224	Handran - Gateview Complex, 30-60 % slopes	Mod	Mod	Severe-s	Mod
225	Handran - Gateview Complex, 30-80 % slopes	Mod	Mod	Severe-s	Mod
227	Handran - Gateview Complex, 15-60 % slopes	Mod	Mod	Mod-Severe-s	Mod
233	Handran - Typic Cryochrepts Complex, 15-30 % slopes	Mod	Mod	Mod	Mod
234	Handran - Typic Cryochrepts Complex, 30-60 % slopes	Mod	Mod	Mod-Severe-s	Mod

Map Unit Symbol	Soil Map Unit	Erosion Hazard	Revegetation Limitations	Unsurfaced Road Limitations	Conventional Ski Trail Limitation
314	Leadville - Handran Complex, 30-60 % slopes	Mod	Mod	Mod-Severe-s	Mod
413	Moran - Leighcan Complex, 5-30 % slopes	Mod	Mod	Mod	Mod
417	Moran - Leighcan Complex, 15-60 % slopes	Mod	Mod	Mod-Severe-s	Mod
423	Moran - Teewinot Complex, 15-30 % slopes	Mod	Severe-f	Severe-l	Severe-r
428	Moran - Teewinot Complex, 15-85 % slopes	Mod	Severe-f,s	Severe-l,s	Severe-r
444	Pinesile - Gateview Complex, 30-50 % slopes	Severe	Mod	Mod-Severe-v	Mod
513	Scout - Leadville Complex, 15-30 % slopes	Mod	Mod	Mod	Mod
514	Scout - Leadville Complex, 30-60 % slopes	Mod	Mod	Mod-Severe-s	Mod
515	Scout - Leadville - Rock Outcrop Complex, 30-85 % slopes	Mod	Severe-s	Unsuitable-s,x	Unsuitable-x
516	Scout - Leadville Complex, 30-80 % slopes	Mod	Mod	Mod-Severe-s	Mod
517	Scout - Leadville Complex, 15 - 60 % slopes	Mod	Mod	Mod-Severe-s	Mod
523	Scout - Typic Cryochrepts Complex, 15-30 % slopes	Mod	Mod	Mod	Mod
524	Scout - Typic Cryochrepts Complex, 30-60 % slopes	Mod	Mod	Mod-Severe-s	Mod
527	Scout - Typic Cryochrepts Complex, 15-60 % slopes	Mod	Mod	Mod-Severe-s	Mod
529	Scout - Typic Cryochrepts Complex, 2-60 % slopes	Mod	Mod	Slight-Severe-s	Mod
612	Typic Cryochrepts - Handran Complex, 5-15 % slopes	Mod	Mod	Slight	Mod
617	Typic Cryochrepts - Handran Complex, 15-60 % slopes	Mod	Mod	Mod-Severe-s	Mod
619	Typic Cryochrepts - Handran Complex, 5-60 % slopes	Mod	Mod	Mod-Severe-s	Mod
623	Typic Cryochrepts - Lithic Cryorthents - Rock Outcrop Complex, 2-40 % slopes	Mod	Severe-f	Severe-l,x	Severe-r

Map Unit Symbol	Soil Map Unit	Erosion Hazard	Revegetation Limitations	Unsurfaced Road Limitations	Conventional Ski Trail Limitation
625	Typic Cryochrepts - Lithic Cryorthents - Rock Outcrop Complex, 30-85 % slopes	Mod	Severe-f,s	Unsuitable-l,s,x	Unsuitable-x
628	Typic Cryochrepts - Lithic Cryorthents - Rock Outcrop Complex, 15-80 % slopes	Mod	Severe-f,s	Unsuitable-l,s,x	Unsuitable-x
713	Handran - Typic Cryochrepts - Aquic Cryoborolls Complex, 2-40 % slopes	Mod	Mod	Severe-w	Mod
815	Rock Outcrop - Talus, 30-85 % slopes	NA	Severe-t,c	Unsuitable-t,x	Unsuitable-t,x
Rating Modifiers: c - soil coarse fragments l - shallow soils t - talus or boulders x - cliffs, rock outcrop e - erodibility r - revegetation v - soil bearing capacity f - fertility s - slope w - wetlands, water table, poorly drained					

3.2.3 HYDROLOGY

Much of the information describing the hydrology of the CAT III area has been derived from previously completed reports documenting conditions within the PA. In addition, current information on channel conditions, water quality, and stream habitat conditions was acquired through an on-site survey by the Forest Service in September 1994 (USDA-FS 1994b). T-walk, a water resource analysis method developed by Region Two of the Forest Service (Ohlander 1992), was used in this survey of Two Elk Creek. This method provides an assessment of the overall health of a stream and, with repeated use, provides a means of identifying trends in stream health. Assessment of the geomorphic and biological components of Two Elk Creek occurred as part of the T-walk survey. Additional hydrological information was obtained from reports by Dames and Moore (1993) and W.J. Miller and Associates (1993a; 1993b).

3.2.3.1 General

As mentioned above, the CAT III development area primarily consists of north-facing slopes bounded by the ridge line of Battle Mountain on the south, Two Elk Pass on the east, Two Elk Creek on the north, and the west ridge of West Super Bowl on the south. Two separate, relatively small areas on the north side of Two Elk Creek are also considered part of the PA. Within the CAT III area, there are several smaller sub-watersheds that are tributaries to Two Elk Creek. These include from east to west: Commando Bowl, East Pete's Bowl, Pete's Bowl, Super Bowl, West Super Bowl, and on the north side of Two Elk Creek, Tea Cup Bowl and Lower Sun Down Bowl. These drainages, along with five non-channelized hillslopes (NCHs), form the primary units of analysis for describing the affected environment and environmental consequences of the alternatives regarding hydrology of the PA. Figure 3.3 delineates the boundaries of these watersheds within the CAT III area.

Two Elk Creek is a tributary of the Eagle River. The Eagle River flows into the Colorado River approximately 40 miles to the west of the PA near the town of Dotsero. The Eagle River watershed covers approximately 975 square miles in the headwaters of the Colorado River Basin. The watershed is located almost entirely within Eagle County, Colorado, at an elevation ranging from about 6,000 to over 14,000 feet. Discharge of the Eagle River, as measured at a stream gage below the confluence of Gypsum Creek, averages about 415,000 acre-feet per year. About 75 percent of the average annual runoff of the Eagle River occurs during the 3 months of May, June, and July in response to snowmelt runoff (Enartech 1994).

Minimum instream flows are defined by the Colorado Division of Wildlife (CDOW) as the streamflows necessary to maintain aquatic life. Minimum instream flows for the Eagle River between Cross Creek and Gore Creek, the reach just below the confluence of Two Elk Creek, are 50 cubic feet per second (cfs) during the summer (May 1 - September 30) and 20 cfs during the winter (October 1 - April 30). Flow rates of the Eagle River during peak snowmelt runoff often exceed 3,000 cfs in late June or early July (Enartech 1994).

Low flow conditions in the Eagle River during February and March and, in dry years, late August and September, can reduce available trout habitat and contribute to increased water temperatures and decreased water quality (Enartech 1994). On the other hand, the on-going cleanup of Eagle Mine is improving water quality and thereby ameliorating impacts to stream habitats (Enartech 1994).

Low instream flows in the Eagle are also important in terms of their influence on the Colorado River. Four endangered fishes, the Colorado squawfish (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), bonytail (*Gila elegans*), and humpback chub (*Gila cypha*) inhabit downstream reaches of the Colorado River

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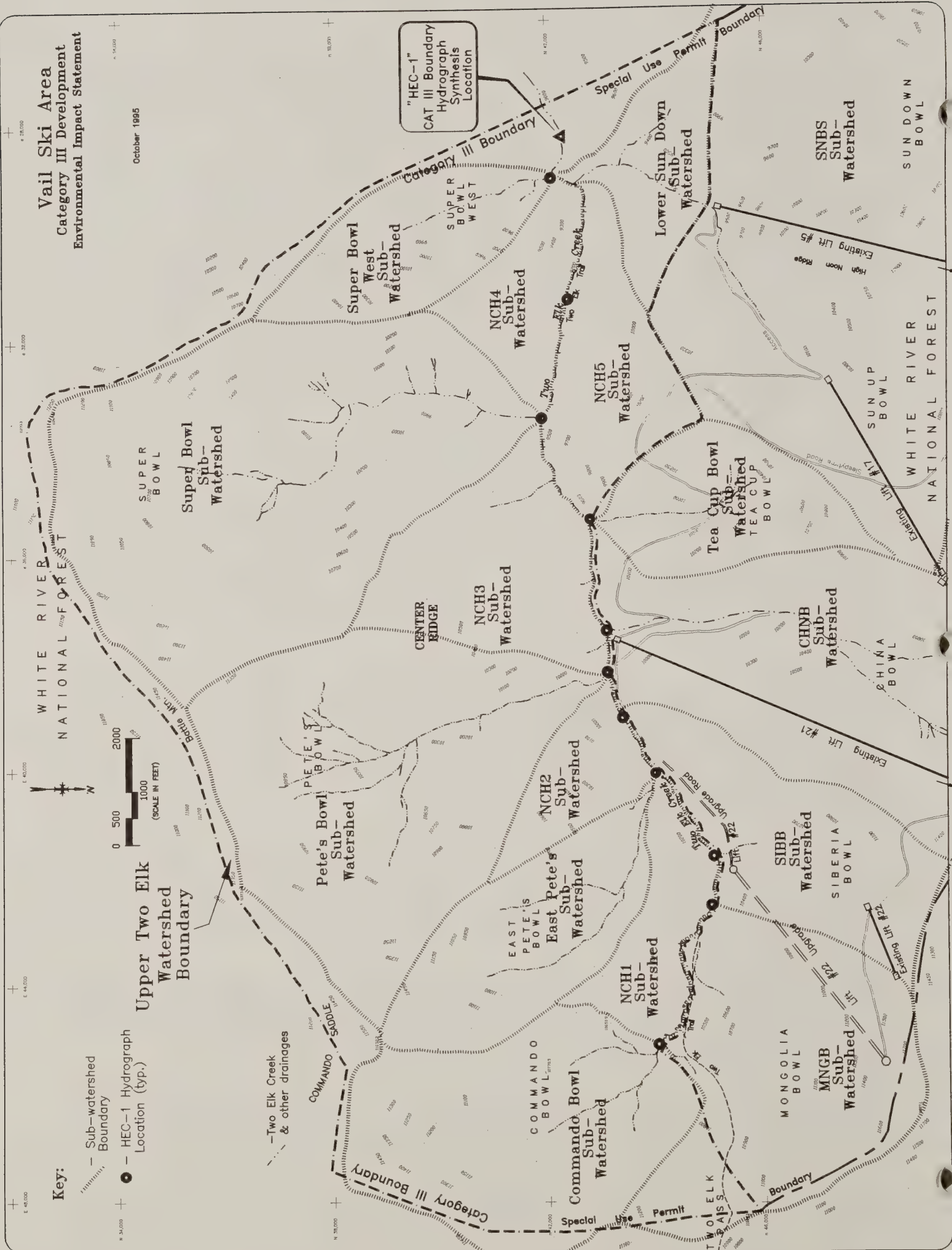


Figure 3.3. Boundaries of sub-watersheds in the upper Two Elk Creek watershed.

and the FWS has identified upstream water depletions as a primary source of impacts to these species. The reader is referred to the Aquatic Biology section for more information on the fisheries and other aquatic resources associated with the Colorado and Eagle rivers and Two Elk Creek.

3.2.3.2 Hydrology and Climate

Average annual precipitation in the PA is approximately 35 inches (Dames and Moore 1993; USDA-SCS 1994). The seasonal distribution is approximately 48 percent winter, 36 percent spring, and 16 percent summer and fall (USDA-SCS 1994). Although total annual precipitation is dominated by snowfall, high-intensity, short-duration precipitation events can occur during the summer.

For storm water discharge analysis, the use of the 10-year, 24-hour rainfall event is recommended (USDA-FS 1995a). For the Rocky Mountains in the vicinity of Vail Ski Area, the amount of precipitation expected to occur in such an event is 1.83 inches (W.J. Miller and Associates 1973). The amount of precipitation associated with a 100-year, 24-hour storm is estimated to be 2.80 inches (W.J. Miller and Associates 1973).

The USDA Soil Conservation Service (SCS) SNOTEL data for the Mid-Vail weather station indicate that the peak snow water equivalent (SWE) within the PA occurs toward the end of April or early May and declines rapidly through the remainder of May and early June. At this elevation (approximately 10,250 feet), the SWE is typically at or near zero by the middle of June (USDA-SCS 1994).

3.2.3.3 Two Elk Creek Watershed

3.2.3.3.1 Introduction

Based on the USGS 7.5-minute quad map of the PA, Two Elk Creek is a third-order watershed. Elevations within the CAT III area range from approximately 9,000 feet where Two Elk Creek flows out of the western portion of the study area to over 11,600 feet in the southwestern portion of the study area on the rim of Commando Bowl. To the west near the Town of Minturn, Two Elk Creek joins the Eagle River at an elevation of approximately 8,000 feet.

During the T-walk survey (USDA-FS 1994b), the channel types of the sampled reaches were classified as B3 and B4 streams according to Rosgen's (1994) classification of natural rivers. These channel types are characterized by having a low to moderate sediment supply, low streambank erosion potential, and moderate vegetation controlling influence, i.e., vegetation that influences the width/depth ratio of the stream. They also have low to moderate sensitivity to disturbances such as increased sedimentation and streamflow volumes and/or peaks, and excellent potential for recovery once the cause of the disturbance is corrected. The results of the T-walk survey indicate that the stream health of Two Elk Creek is robust within the CAT III area.

The upper Two Elk Creek watershed, the area that includes the Back Bowls and lies above the western CAT III area boundary (see Figure 3.3), comprises approximately 6,645 acres. The distance from the top of this predominantly west-facing watershed to the downstream boundary of the PA is approximately 4 miles. The distance from the headwaters of Two Elk Creek to its confluence with the Eagle River is approximately 7 miles.

3.2.3.3.2 Soils and Geology

Dominant geologic landforms within the CAT III area include high bedrock ridges of the Minturn formation grading into moderate to steep colluvial slopes. Debris fans are common on steep, landslide-prone slopes and the drainage bottoms are comprised of alluvial fans, terraces, and stream alluvium. With the exception of those associated with wetlands and bottomlands, soils are predominantly loams and sandy loams with low to severe erosion potential depending primarily on slope gradient. More detailed descriptions of geology and soils are presented above in the Geology and Soils sections.

3.2.3.3.3 Vegetation

Within the CAT III area, riparian zones may be either deciduous shrub- or forb-dominated. Shrub-dominated riparian zones have an overstory of several willow species including *Salix brachycarpa*, *S. monticola*, and *S. planifolia* and understories typically comprised of tall bluebells, heartleaf bittercress, Hornemann's willow-herb, arrowleaf groundsel, monkshood, Barbey's larkspur, various sedges, and longstyle and arctic rushes. Forb-dominated riparian zones typically consist of the above understory species without the willow overstory. Willow-dominated riparian zones occur along Two Elk Creek and reach their highest densities in the eastern portion of the PA near the headwaters of the creek. The forb-dominated type tends to occur at higher elevations along side the channels that drain each of the sub-watersheds and in seep/spring areas found throughout the PA. For more detailed information on riparian and other vegetation types, refer to the Vegetation section of this chapter.

3.2.3.3.4 Aquatic Biology

Two Elk Creek is characterized by good to excellent aquatic habitat. The stream supports a diverse assemblage of macroinvertebrates and periphyton, as well as a large stable brook trout (*Salvelinus fontinalis*) population (W.J. Miller and Associates 1993a; 1993b). Minor sources of habitat degradation exist in the form of localized sediment inputs from beaver dams, roads, and other soil disturbances associated with existing facilities (e.g., the base of Lift 21). A more detailed description of the aquatic biology of Two Elk Creek may be found in the Aquatic Biology section below.

3.2.3.3.5 Water Quantity

Factors considered in estimating the net amount of water (water yield) likely to flow out of a given area generally include: length of growing season, the quantity and type of existing vegetation, soil type, aspect, elevation, the amount and distribution of precipitation, infiltration rates, and drainage size. The presence of vegetation decreases gross water yield through transpiration, the process by which plants release water vapor to the atmosphere. Thus, all else being equal, the water yield of a given drainage decreases as the amount of vegetation increases in both size and density over time.

Although actual hydrographs for Two Elk Creek are not available, six instantaneous flow measurements were taken by Dames and Moore (1993) on the lower portion of the stream near its confluence with the Eagle River. A staff gage was placed in this area and flows were estimated based on stage height. The highest estimated flow was 180 cfs and occurred between 20 May and 11 June, 1993. The highest discharge actually measured in the field was 95 cfs taken at the mouth of Two Elk Creek on 11 June of 1993. Streamflow at this location had declined to 10 cfs by August 20 of that year.

Other streamflow data presented by Dames and Moore (1993) included instantaneous flow measurements taken at several locations along Two Elk Creek during September 1992 and June 1993, i.e., during characteristically low- and high-flow periods. Utilizing this latter data in conjunction with detailed streamflow data from Wearyman Creek, a nearby watershed with similar size and hydrologic characteristics as Two Elk Creek, a synthetic hydrograph for the upper Two Elk Creek watershed was adapted by Basin Hydrology, Inc. (Pioneer 1995a) for the purposes of evaluating current and potential future flows on Two Elk Creek. The average annual flowrate for this area was estimated to total 11.9 cfs, using this procedure. Other hydrologic variables calculated from the synthetic hydrograph included peak flows, low flows, and annual discharge. Estimated peak flows of 64 cfs would occur in June and estimated low flows of 1.7 cfs would occur in January and February. Annual water yield from the upper Two Elk Creek watershed was estimated to be approximately 8,600 acre-feet.

3.2.3.3.6 Water Quality

Water quality parameters for Two Elk Creek were measured by Dames and Moore during September of 1992, a low-flow period for Two Elk Creek (Dames and Moore 1993). During the period of this study, the pH of the stream averaged about 8.5 among the four sampling stations within the upper Two Elk Creek watershed. A variety of other water quality parameters were measured in the lab from water samples taken at these stations. Table 3.3 shows the concentrations of four of these constituents along with the Colorado State Department of Health, Water Quality Control Commission standards for each (CDH 1994). The parameters listed include ammonia, nitrate and nitrite, phosphorus, and total suspended solids. As can be seen from Table 3.3, Two Elk Creek is well below the published maximum allowable concentrations of ammonia and nitrate/nitrite.

Table 3.3. Water quality of Two Elk Creek (mg/L)									
Constituent	State Standard ^a	TE-1 ^b		TE-2 ^b		TE-3 ^b		TE-4 ^b	
		Low ^c	High ^c	Low ^c	High ^c	Low ^c	High ^c	Low ^c	High ^c
Ammonia	0.43	0.05	0.08	0.15	0.04	0.07	0.09	0.05	0.07
Nitrate & Nitrite	0.15	<0.05	0.08	<0.05	0.08	<0.05	0.11	<0.05	<0.05
Phosphorus	—	0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Total Suspended Solids	—	<4	<4	<4	6	<4	<4	<4	4

^a = standards are from the Colorado Department of Health (CDH 1994).
^b = values were measured from water samples collected at four different stations along Two Elk Creek by Dames and Moore (1993). Station TE -1 was located at the base of Commando Bowl, TE-2 below the confluence of East Pete's Bowl, TE-3 just upstream of the Super Bowl confluence, TE-4 near the western boundary of the CAT III area.
^c = "Low" refers to samples taken during a low flow period (September); "High" refers to those taken during high flows (June).

Though a healthy stream, the principal cause of human-related impacts to the water quality of Two Elk Creek is sedimentation. Existing sediment sources within the upper Two Elk basin are primarily those associated with the Sleepytime Skiway/Road and the base of Lift 21. Of these, the base of Lift 21 is probably the most significant. Several mitigation measures have been undertaken to reduce the amount of erosion from these areas.

At the base of Lift 21 a rock-lined drainage gutter has been placed around the upper edge of the fill slope to prevent water from draining directly down the slope and entering Two Elk Creek. Runoff is instead routed through vegetation before it reaches the creek. In addition, silt fencing has been installed between the base of this

fill slope and the edge of Two Elk Creek to help filter sediment out of the hillslope runoff that does occur. Other potential sources of sediment already existing in the Back Bowls area include the Sun Up and Sun Down Catwalks, the Commando Run Trail, and the Two Elk Trail.

3.2.3.3.7 Other Hydrologic Characteristics

In addition to flow regime, measures such as channel length, drainage density, and stream gradient provide indications of the hydrological characteristics of a given watershed. The total length of Two Elk Creek within the CAT III area portion of its watershed is approximately 21,300 feet. Drainage density, the ratio of total channel length to catchment area, for the upper Two Elk Creek watershed is 20.01. Stream gradient, the slope of the channel bed, was calculated from a base map of the PA (Figure 3.3) using AutoCAD computer software. With this method, stream gradient ranged from 5.0 percent to 13.3 percent with an average of 7.8 percent for Two Elk Creek within the CAT III area boundary. It is important to note that, because the base map is not at a fine enough scale to capture the detailed meanderings of Two Elk Creek, these and other measured stream gradients are likely to be somewhat overestimated.

3.2.3.4 Principal Sub-Watersheds

Hydrologic characteristics of the sub-watersheds within the CAT III area are given in Table 3.4 below. The values of these variables were calculated based on measurements taken from the CAT III area watershed map (Figure 3.3) which, in turn, was derived from aerial photography and ground reconnaissance. Data on flow regimes for the sub-watersheds are not available.

Table 3.4. Hydrologic characteristics of the sub-watersheds of the CAT III area.					
Watershed Name	Drainage Area (acres)	Percentage of Upper Two Elk Watershed	Channel Length ^a (ft)	Drainage Density (ft/ac)	Stream Gradient ^b (%)
Commando Bowl	491.3	7.39	p: 1164 I: 5068	12.68	a: 11.7 r: 7.7-31.0
East Pete's Bowl	289.5	4.35	p: 0 I: 8728	30.15	a: 15.9 r: 9.0-45.9
Pete's Bowl	750.4	11.29	p: 947 I: 16802	23.65	a: 16.1 r: 9.1-36.0
Super Bowl	948.0	14.26	p: 3808 I: 11565	16.22	a: 13.2 r: 8.4-41.3
Super Bowl West	209.9	3.15	p: 1447 I: 2064	16.73	a: 27.4 r: 15.7-39.7
Lower Sun Down Bowl	154.6	2.32	p: 0 I: 4282	27.70	a: 10.8 r: 9.0-15.4
Tea Cup Bowl	215.3	3.24	p: 758 I: 4581	24.80	a: 22.9 r: 19.8-34.5
^a p = perennial stream; I = intermittent stream ^b a = average; r = range					

Although not associated with any of the sub-watersheds, non-channelized hillslopes (NCHs), i.e., areas contributing groundwater and runoff directly to Two Elk Creek, form a considerable portion of the Two Elk Creek watershed. These areas, numbered consecutively from east to west within the CAT III area, are NCH1 (81.3 acres) between Commando and East Pete's bowls, NCH2 (106.9 acres) between East Pete's and Pete's bowls, NCH3 (288.0 acres) between Pete's and Super bowls, NCH4 (140.3 acres) between Super Bowl and Super Bowl West, and NCH5 (209.9 acres) between Lower Sun Down and Tea Cup bowls. Although there exists a small channel within a portion of NCH3, the area of the catchment associated with this channel is too small and the stream flow too ephemeral to warrant consideration on the sub-watershed level.

3.2.4 AIR QUALITY

3.2.4.1 Meteorology and Climate

This section is based on a report By Air Sciences, Inc. (1985), and includes both the Vail Valley and the ski area itself. The Vail Valley experiences a typical mid-latitude, high-elevation climate with cool summers and cold winters. Humidity is low and diurnal temperature fluctuations are high. Prevailing air currents are from the west and the region generally receives its precipitation from Pacific storms. Precipitation is higher in the winter than the summer. Winter precipitation occurs as abundant snowfall, while summer precipitation occurs as localized thunderstorms (U.S. Department of Commerce 1975 *Cited In*: Air Sciences, Inc. 1985).

The base of Vail Mountain is at 8,200 feet and the crest of the front side is at 11,250 feet, in comparison to the summit of Battle Mountain which is approximately 11,600 feet. Vail Valley lies at the base of Vail Mountain, oriented on an east-west axis. It is 9 miles long and approximately 1,700 feet wide. The mountains rise rapidly on both the north and south sides of the valley. Over its 9-mile length, the valley rises 700 feet from 7,900 to 8,600 feet. It forms a long, narrow, and flat air basin with a restriction at the west and lower end (Air Sciences, Inc. 1985).

Wind patterns in Vail Valley exhibit typical mountain-valley dynamics. Winds on the mountain sides are not measured, but are expected to be driven by synoptic conditions when there is a strong pressure gradient in the area. In the absence of a synoptic gradient, nighttime downslope air drainage is expected. Wind data collected in 1980 by the Colorado Air Pollution Control Division (1980) showed that the predominant wind currents come from the west with an average wind speed of 3 mph and a maximum hourly speed of 14 mph. Lowest nighttime average was 0.6 mph and lowest daytime average was 2.5 mph. These low wind speeds prevent dispersion, which in turn, increases the likelihood of inversions in area. Inversion data collected by Whiteman and McKee (1977) indicate an average inversion duration of about 16 hours, with a maximum duration of 22 hours. The average height of these inversions was approximately 920 feet and maximum height was approximately 1150 feet (Air Sciences, Inc., 1985).

Monthly temperature and precipitation from 1961 through 1980 has been taken by the Colorado Climate Center (at Colorado State University) from stations in Dillon, Climax, Eagle, Aspen and Meredith. Daytime temperature highs range from 32 degrees F in January to 79 degrees F in July. Diurnal variation averages 35 degrees. Average yearly precipitation for the above stations is about 25 inches with a monthly maximum of 2.5 inches in January and a minimum of 1.5 inches in September. Monthly temperature and precipitation averages are shown in Air Sciences, Inc. (1985).

3.2.4.2 Standards and Regulations

The Clean Air Act (1963, as amended) established National Ambient Air Quality Standards (NAAQS) to protect the public health (primary standards) and welfare (secondary standards) from possible adverse effects due to ambient air pollutants. NAAQS have been established for six criteria air pollutants. These are sulfur dioxide (SO₂), carbon monoxide (CO), ozone (O₃), lead (Pb), nitrogen dioxide (NO₂), and fine particulate matter with an aerodynamic diameter of 10 microns (0.001 millimeter, or 0.00003937 inches) or less (PM₁₀). Standards are usually set for annual average, 24-hour or 3-hour periods. The annual average is generally calculated as an arithmetic mean. NAAQS for these pollutants are presented in Table 3.5.

Common sources of these pollutants are: SO₂ - fuel burning such as coal-fired power plants, coke ovens, and smelters; CO - incomplete motor vehicle or wood burning combustion; O₃ - photochemical reactions in smog, large electrical equipment and fireplaces; NO₂ - (and other oxides of nitrogen, NO_x), fuel burning such as power plants, industrial processes and vehicle emissions; Pb - nonferrous smelters and "leaded" gasoline vehicle emissions; and PM₁₀ - fireplaces, woodstoves, road sanding, re-entrained dust from silt and mud loading (deposition of mud) on unpaved/ungravelled streets, construction, vehicle emissions, industrial sources, and natural sources. The Vail area does not exceed federal standards for any of the pollutants listed in Table 3.5, thus its categorization is "attainment."

3.2.4.3 Ambient Air Quality

Ambient air quality data have been collected in the Vail area since 1973. From 1980 to 1987, total suspended particles (TSP) were monitored at two locations, the Vail Medical Center and the Safeway store in West Vail. In December 1987, the EPA replaced TSP monitoring with new National Ambient Air Quality Standards for PM₁₀. At that time the sampling sites were relocated to a single location at the Upper Eagle Valley Water and Sanitation building, where they currently remain.

3.2.4.3.1 Non-Particulate Pollutants

Neither the TOV nor Eagle County has monitored or is currently monitoring non-particulate pollution (i.e., SO₂, CO, O₃, and NO_x). Carbon monoxide is an exception in that it was monitored during the winter of 1987-88. No exceedances of federal standards were found during this monitoring (TOV 1993). It is believed that the likelihood of non-particulate pollutants becoming an impediment to attainment is remote. This, combined with the expense of monitoring, has made it economically infeasible to oversee these pollutants (Pocius, *pers. comm.*, 1995).

3.2.4.3.2 Particulate Pollutants

During the period that TSP was being used as a standard, the TOV exceeded both the federal annual geometric mean standard of 75 micrograms per cubic meter (µg/m³) and the 24-hour primary standard of 250 µg/m³ (Figure 3.4). In 1988 the PM₁₀ standard replaced that for TSP. Since that time the TOV has met the standards for PM₁₀ and is currently classified as an attainment area for that constituent.

A breakdown of PM₁₀ sources for the TOV show that 57 percent of PM₁₀ is due to wood-burning, 39 percent from sand and dirt suspension (primarily from the sanding of I-70), 2 percent from vehicle exhaust, and 2 percent from restaurant grills. Vail Village contributes 35 percent of total PM₁₀ load while Bighorn, East Vail, and West Vail each contribute approximately 21 percent.

Table 3.5. National Air Quality Standards (using reference or equivalent methods)

Pollutant ^a	Averaging Time	Primary Standard ($\mu\text{g}/\text{m}^3$)	Secondary Standard ($\mu\text{g}/\text{m}^3$)
SO ₂	Annual	80	- ^b
	24 hour	365	-
	3 hour	-	1300
PM ₁₀	Annual	50	50
	24 hour	150	150
O ₃	1 hour	235	235
CO	8 hour	10,000 ^c	10,000
	1 hour	40,000 ^d	40,000
Pb	Quarterly	1.5	1.5
NO ₂	Annual	100 ^e	100

^a SO₂ - sulfur dioxide, PM₁₀ - particulate matter with an aerodynamic size equal or less than 10 microns, O₃ - ozone, CO - carbon monoxide, Pb - lead, NO₂ - nitrogen dioxide
^b - no standard
^c - 10,000 $\mu\text{g}/\text{m}^3$ is equal to 9 parts per million, ppm
^d - 40,000 $\mu\text{g}/\text{m}^3$ is equal to 35 parts per million, ppm
^e - 100 $\mu\text{g}/\text{m}^3$ is equal to 0.053 parts per million, ppm
 Source: 40 CFR Part 50 (revision date: July 1992, Code of Federal Regulations)

3.2.4.3.3 Visibility

Visibility is a measure of atmospheric transparency. It is an important component of air quality in scenic areas. Most reductions in visibility are caused by airborne particulate matter. During transport, particulate emissions are mixed together to form a uniform haze which contributes to decreased visible range. Other visual impairments can be caused by layered haze (pollutants from one or more sources appear as layers due to poor atmospheric mixing conditions), or plumes (pollutants appear as a continuous plume originating from a single source) (USDA-FS 1993d).

In spite of its attainment status, the Vail area does experience haze. The TOV notes that brown haze has continued to persist since 1988. Although it is thought the PM₁₀ standard effectively protects human health, it may be inadequate as a visibility standard for inversion-prone mountain communities (TOV 1993). Visibility is primarily affected by those particulates that most effectively scatter light. These range in size from 0.3 to 1.5 μm in diameter. Particles from wood-burning are especially effective at scattering light when compared with dust and sand sources. The high proportional input of wood-burning particulate matter may be the cause of the Vail area's visibility problems. The TOV (1993) has enacted a program to encourage lodges and residents to convert from wood-burning appliances to gas appliances. This program has significantly reduced PM₁₀ and if continued, could eventually reduce haze as well.

3.2.4.3.4 Adjacent Wilderness Lands

Wilderness designation includes direction for management for clean, pristine airsheds which allows for only small increases in pollutants from any source. The EPA has promulgated regulations to prevent emissions from significantly deteriorating the air quality in these areas. These regulations, called Prevention of Significant Deterioration (PSD), stipulate that the source: 1) not cause a decline in ambient air quality and, 2) use best

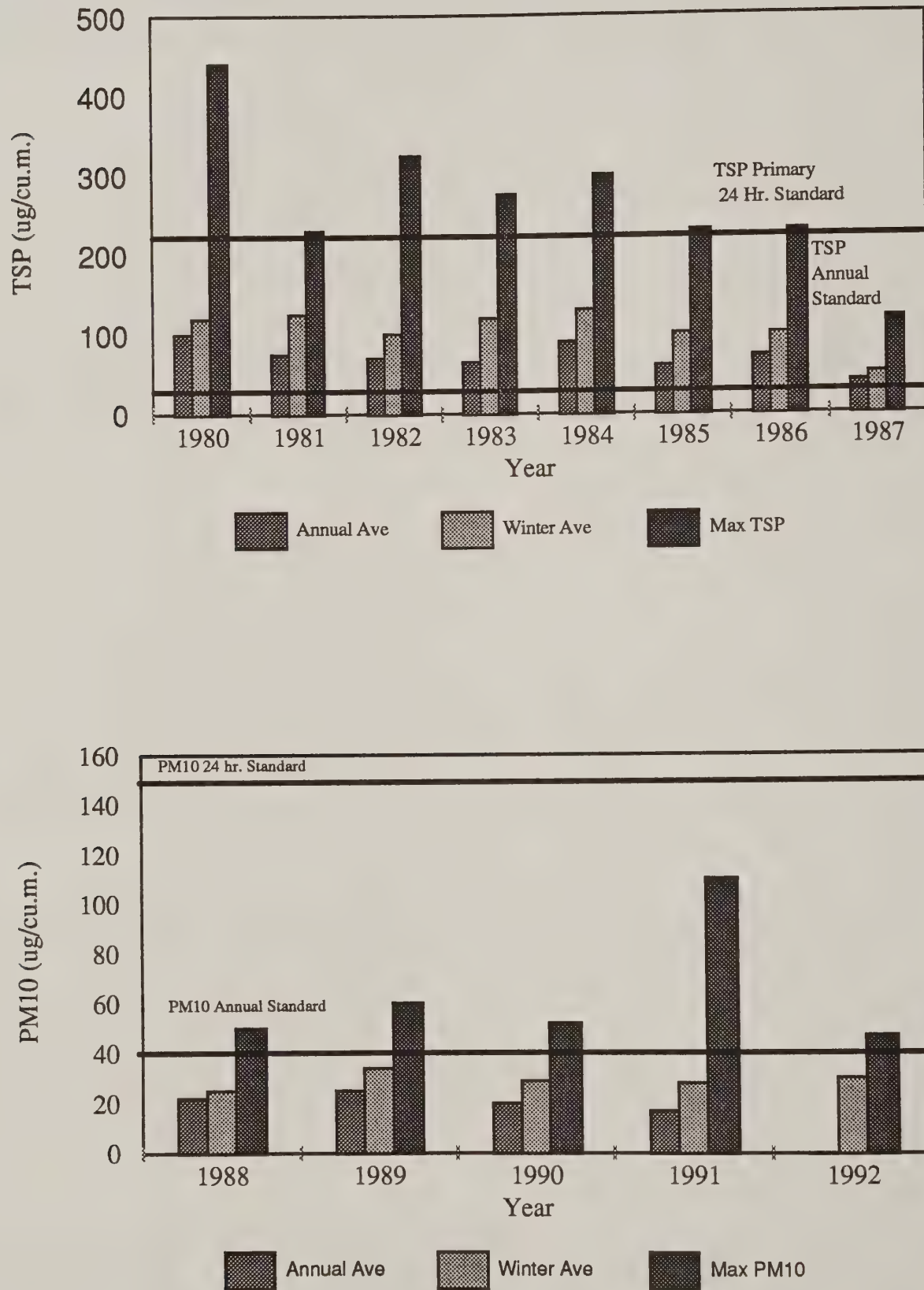


Figure 3.4. TSP and PM₁₀ for Vail (TOV 1993)

available control technology to limit emissions. PSD permits are required from major new stationary sources of emissions which emit 100 tons or more per year of CO, SO₂, NO₂, O₃, or particulate matter. Ski area emissions represent both stationary and mobile sources. A PSD permit is not required for a ski area expansion because it is not classified as a major stationary source. However, if the ski area development were to increase mobile sources beyond those which have been analyzed, these would need to be evaluated for their potential to absorb some of the PSD increment. Maximum allowable PSD increments over baseline are displayed in Table 3.6. Table 3.6 includes the three land use classifications for PSD. These categories are Class I, Class II, and Class III.

Generally, Class I is the designation for clean, pristine airsheds and would permit little or no increases in pollutants; the Class II designation is applied to clean air areas where moderate increases in pollutants would be permitted; and Class III is the designation for clean air areas where increases up to the NAAQS would be allowed to permit industrial growth. The Holy Cross Wilderness is a Class II airshed and it could be affected by development in the CAT III area. The Eagles Nest Wilderness is the only Class I airshed that could be affected by the CAT III area development. To date this wilderness has not had any portion of its PSD increment used ("triggered") by another project.

Table 3.6. Maximum allowable PSD increments over baseline conditions

Prevention of Significant Deterioration of Air Quality Standards				
		Maximum Allowable Increments ($\mu\text{g}/\text{m}^3$) ^a		
Pollutant: ^b	Averaging Period	Class I	Class II	Class III
Particulate as	Annual	4	17	34
PM ₁₀	24 hour	8	30	60
Particulate as	Annual	5	19	37
TSP	24 hour	10	37	75
SO ₂	Annual	2	20	40
	24-hour	5	91	182
	3-hour	25	512	700
NO ₂	Annual	2.5	25	50

Variances to the Class I increments are permitted under certain conditions as specified in Section 165 (d)(C)(iii) and Section 165 (d)(D)(I) of the CAAA.

^a $\mu\text{g}/\text{m}^3$ = micrograms per cubic meter

^b PM₁₀ = Particulate Matter under 10 μm , TSP = Total Suspended Particulate, SO₂ = Sulfur Dioxide, NO₂ = Nitrogen Dioxide

Source: 40 CFR 52.1 and 42 U.S. Code 7401 et seq Section 163 (revision date: July 1992, Code of Federal Regulations)

3.2.5 NOISE

Noise has been defined as unwanted sound. Besides being a nuisance, it can, under some circumstances, create health and safety hazards. For instance, long-term exposure to high levels of construction or traffic noise can be

damaging to unprotected individuals. Increasingly there is also an aesthetic component to the concern about noise, especially in rural or recreational settings.

Noise can have a transient impact, which is dependent on factors such as weather, temperature, and time of day. Automobiles, busses, and trucks contribute to the daily noise level in the Vail area, especially given that I-70 is a key transportation corridor within the Vail Valley. The greater Vail area has a great deal of on-going residential and commercial construction and development which adds to noise levels. Skiing, special events, and other recreational activities, are critical components of the local economy, but bring their own sources and levels of noise. The TOV adheres to the noise standards established in Title 25, Article 12 of the 1973 Colorado Revised Statutes, which protects public safety and welfare.

Seasonal activities change the level and overall composition of the noise. Winter at the Vail Ski Area includes noise from snowmaking, grooming, lift operations, routine snow removal, avalanche control measures, and periodic peak days which generate appreciably higher levels of automobile and bus traffic. During the summer, truck traffic related to summer construction and maintenance is another common source of noise, especially near many residential and commercial areas. During scoping, snowcat use on Forest Road was identified as an issue. Some residents along this route are concerned with the sound and disruption associated with snowcats that travel this route each day en route from the VA maintenance facility on the South Frontage Road for grooming, maintenance, and refueling (Chapman, *pers. comm.*, 1995).

Though under a management prescription intended to emphasize developed downhill skiing, the CAT III area offers a "backcountry" recreational experience that is generally free of noise. Sources of winter noise in the CAT III area are snowcats and intermittent avalanche control measures. Noise levels within the PA are negligible during non-ski periods, primarily because the area is somewhat isolated from the development and population center on the front side of Vail Mountain. Ongoing operational and maintenance activities in the Back Bowls periodically increase noise levels in the CAT III area, however, these effects are generally temporary and transitory. Current management includes closure of China Bowl between May 1 and July 1 in order to protect elk calving habitat.

3.3 BIOLOGICAL ENVIRONMENT

Three geographical areas of analysis were established for the disciplines of vegetation, wildlife, and biodiversity. The existing conditions for these three levels for these specific disciplines are described in this chapter in order to provide a basis for comparison in the analyses found in Chapter 4. The PA includes that area described in Chapter 2 and is the same for all disciplines, including the three noted above. However, because of considerations associated with plant and wildlife communities such as biological gradients, mobility, inter- and intra-relatedness, and the overall need to view these resources in a more comprehensive fashion, two other levels of analysis were utilized. The LA includes a much larger geographical area than the PA. This is necessary in order to provide insight and understanding of how potential impacts on the PA could affect abundance, distribution, viability, and cumulative impacts for individuals and communities of a given species. Similarly, a still larger area of analysis is represented by the RA. The purpose of the RA level of analysis is mostly related to understanding cumulative impacts for large-scale types of biological communities such as changes in forested types, herd sizes, and the juxtaposition of developed versus undeveloped habitats. Please note that the LA and RA levels of analysis apply only to sections discussing vegetation, wildlife, and biodiversity.

3.3.1 AQUATIC BIOLOGY

3.3.1.1 General Fisheries

3.3.1.1.1 Two Elk Creek

Field studies measuring fish populations, habitat quality, and macroinvertebrate and periphyton abundance were conducted by W.J. Miller and Associates in Two Elk Creek in 1993. This section is primarily based on technical reports prepared by W.J. Miller and Associates (1993a; 1993b).

3.3.1.1.1.1 Habitat

Two Elk Creek is a relatively steep third-order stream located along the northern portion of the CAT III area. Habitat parameters were quantified and mapping of Two Elk Creek was conducted using a Forest Service Basin-Wide Protocol (Winters and Bennett 1993). Major habitat types include glides (one type), pools (six types), and riffles (eight types). The structural association (cause of formation) was also recorded.

The riffle-to-pool ratio for Two Elk Creek is essentially even, i.e., each riffle is usually followed by a pool. However, riffle habitat dominates the stream making up about 89 percent of its length while pools comprise only about 10 percent. Bank stability is excellent throughout the reach with more than 90 percent of the study area having stable vegetated banks. More than 30 percent of the stream has some type of cover, instream or overhead, for fish.

The majority of Two Elk Creek exhibits little sedimentation except in areas associated with beaver dams. Five breached beaver dams were observed between the lower Sun Down Bowl and Tea Cup Bowl drainages and, five more were observed between Tea Cup and China Bowl drainages. Two active beaver dams were also observed between Tea Cup and China Bowl drainages. Upstream of the China Bowl drainage one active and one breached dam were observed. In those areas with inactive dams, the stream has braided and downcut through the abandoned dams, causing local scouring. Sand and silt deposits occurred above all dams. In spite of these localized sources of sediment, habitat conditions were observed to be good or excellent throughout the reach. Sloughing of the fill slope for the base terminal of Lift 21 has occurred, but otherwise there is little evidence of eroding stream banks. The lack of bank erosion indicates that sediment enters the stream mainly through overland flow.

3.3.1.1.1.2 Water Quality

As noted in the Hydrology section, water quality measurements were taken at four sampling sites on Two Elk Creek: upstream (TE-1 and TE-2), at the downstream boundary (TE-3), and one mile downstream from the proposed ski development area (TE-4). Analysis of these samples and data from the fish and invertebrate population surveys indicated that water quality in Two Elk Creek is good to excellent.

3.3.1.1.1.3 Fish Population

Two Elk Creek supports a relatively large and stable trout population. Fish densities and biomass are excellent for the size and elevation of the stream. Observed densities (fish/linear mile) generally increased in a downstream direction while fish biomass (kg/ha) decreased. Length-to-weight condition factors appear to be higher at upper

sites. Length-to-frequency distributions indicate the presence of at least 3 year-classes of trout. Fish and spawning beds were observed throughout the length of the stream in spite of several instream structures that appeared to block migration. Apparently fish are able to circumvent these barriers during periods of high flow. The only species of fish found during sampling was brook trout (*Salvelinus fontinalis*). The protocol for sampling is found in W.J. Miller and Associates (1993b).

3.3.1.1.2 Eagle River and Tributaries

Two Elk Creek lies within the Eagle River basin. This watershed is 975 square miles and is located in the headwaters of the Colorado River basin. The Eagle River begins near Tennessee Pass and empties into the Colorado River near Dotsero, Colorado. Average yearly discharge is about 415,000 acre-feet (Enartech 1994). The Eagle River and its tributaries are utilized for recreation, domestic water usage, agricultural irrigation and snowmaking. Additionally, the Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) inhabits portions of the Eagle River drainage (ERMP 1995). This fish is classified as a candidate species by the FWS under provisions of the ESA. It is also a Forest Sensitive species on the WRNF.

Water quality of the Eagle River is generally very good, with the exception of a section from the Eagle Mine site near Gilman to the Gore Creek confluence, which sometimes exceeds the state of Colorado's minimum standards for several heavy metals. This exceedance is due to contaminants from past mining activities. Aquatic habitat in this reach has been severely impacted, resulting in limited trout populations. At this time, runoff from the mine and seepage from old tailings piles are being treated before being discharged into the Eagle River. This seems to have improved water quality (Enartech 1994).

Gore Creek, a part of the Eagle River basin, provides a valuable recreational resource for the TOV. Portions have also been classified as a Gold Medal trout fishery.

3.3.1.2 Macroinvertebrates and Periphyton

3.3.1.2.1 Two Elk Creek

Two Elk Creek supports a stable, well-balanced aquatic community. Peryiphyton and macroinvertebrate communities are diverse and contain species that indicate high water quality throughout the study reach. According to W.J. Miller and Associates (1993a), there was a trend toward a decrease in number of individuals and taxa at downstream sampling sites. Sampling during October 1992, at three sites along Two Elk Creek showed high Shannon-Weaver diversity and evenness values indicating healthy, diverse invertebrate communities. Sampling during May 1993 also indicated high diversity and evenness with the exception of site TE-3. Here, Shannon-Weaver diversity and evenness values were much lower than the previous (October 1992) site sample. A principal cause of this low value was high density of the midge, *Micropsectra* sp., indicating a nearby input of organic material. Localized sedimentation was observed at the site. This sedimentation appears to be from two sources, inactive beaver ponds that have breached, and slope erosion near Lift 21 (W.J. Miller and Associates 1993a). A fish survey done by the Forest Service (USDA-FS 1992c) also observed sedimentation in this area and noted the possible source of the sediment as material from the fill slope of the base terminal of Lift 21.

3.3.1.2.2 The Eagle River and Tributaries

While habitat quality of the Eagle River is generally good, the presence of adjacent mining facilities has caused degradation of water quality. The most affected section, from a mile above Gilman to Gore Creek, contains virtually no macroinvertebrates (Enartech 1994).

3.3.1.3 Threatened, Endangered, or Sensitive Fishes

3.3.1.3.1 Federally Listed Fishes

Federal agencies, in consultation with the FWS, are required to ensure that any action they authorize, fund, or carry out will not adversely affect a federally listed threatened or endangered species. A Biological Assessment (BA) is required if federal actions (decisions) associated with the authorization or funding of a project could potentially affect the continued existence of a federally listed species, or results in the destruction or adverse modification of its critical habitat (USDA-FS 1992a).

Informal Section 7 consultation between the Forest Service and the FWS occurred during the completion of the 1986 EA/DN (USDA-FS 1986a and 1986b). In a letter from the FWS (Ruesink per. Com. 1986) to the Regional Forester (James F. Torrence) a Biological Opinion was issued. The consultation concluded that:

“The issuance of a FS Special Use Permit that will allow the expansion of Vail Ski Area, with the inclusion of conservation measures outlined below, is not likely to jeopardize the continued existence of the Colorado squawfish (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), and bonytail chub (*Gila elegans*).”

The letter further stated that the depletion of 117.7 acre-feet per year could be offset by VA contributing \$14.93 per acre foot of water depletion to the Conservation Measures Fund. Given that these funds would subsidize the development of critically important data on the survival needs of the fish and support the restoration of essential habitat, a contribution to this fund was considered a reasonable and prudent alternative that could compensate for or prevent any adverse effects of the water depletion (USDI-FWS 1986). VA paid \$1,757 to Conservation Measures on April 2, 1986. A BA, which augments the BA and BO prepared in 1986, was prepared for the proposed CAT III project. This BA will be on file with the appropriate government agencies.

The FWS provided a list of federally listed threatened, endangered, and candidate fish species that may occur within the area of influence of the Proposed Action (Rose 1994; 1995). These species include the Colorado squawfish (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), bonytail (*Gila elegans*), and humpback chub (*Gila cypha*). Water depletions in the upper Colorado River basin are considered by the FWS to comprise a major impact to the recovery of these fish species. In accordance with this, the FWS has determined that any federal projects resulting in water depletions to the Colorado River system would automatically be assigned “may affect” status in regards to these fish. Impacts and potential conservation measures are identified through a Section 7 consultation of the Endangered Species Act of 1973, as amended, (ESA) between the FWS and the acting federal agency. None of the above listed species have been reported from the Eagle River drainage where the PA is located, but all four are located in the upper Colorado River basin, predominantly below Grand Junction, Colorado.

3.3.1.3.2 Candidate Fish Species

Candidate species for federal listing do not have any legal protection under the ESA. However, it is in keeping with the spirit of the ESA to consider these species before authorizing a project or action which could potentially affect them or cause them to be listed. As part of the NEPA decision-making process, Forest Service policy (USDA-FS 1984) requires that a Biological Evaluation (BE) be prepared to determine if the Proposed Action would lead to federal listing of or loss of viability for a candidate species.

The FWS (Rose 1994; 1995) noted that one Category 2 candidate species may occur in the PA. The Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) is under consideration for listing (Rose 1994; 1995) as threatened or endangered. However, none have been found in waters in the PA (see the General Fisheries section of this chapter).

The Colorado River cutthroat trout has been displaced from its historic habitat at lower elevations, and now inhabits selected higher-elevation headwater streams of the Colorado River (Trotter 1987). The Eagle River and Gore Creek are part of the trout's historic range, and the fish still inhabits these waterways. Although no Colorado River cutthroat trout were found in Two Elk Creek in the 1993 survey (W.J. Miller and Associates 1993b), it is part of the species' historical range. It is thought that brook trout migrated into Two Elk Creek from the Eagle River and displaced the cutthroat trout. Two Elk Creek, due to its excellent physical characteristics, has the potential of providing future habitat for the species.

3.3.2 VEGETATION

This section describes the existing conditions for vegetation types within three specific areas: the PA, LA, and RA. The descriptions of the various vegetation types found within these three areas of analysis are based on different levels and types of information from diverse data bases. Therefore, they are not subsets of each other, even though they are "nested," because not all communities or types are described at the same level of detail. Types and community names are, however, consistent within a given analysis area and there are many useful comparisons that can still be made among the three areas. Specific discussions for each analysis area note the similarity and differences in the cover type descriptions. The PA had the greatest amount of existing information and on-site surveys, resulting in more precise and finer scale data compared to the more general information for the LA and even coarser information at the RA analysis level.

The vegetative component of wetlands, riparian zones, and special aquatic site(s) (SAS) within the PA is described under general vegetation, with further descriptions of each wetland type in the Wetlands section of this chapter. However, because many of the wetlands throughout the CAT III area are forested, and therefore occur as an understory layer of the forest type, they are not delineated on the vegetation map for the PA, but rather on the wetland map (MAP 8). In particular, large areas of both Commando and East Pete's bowls have forested wetland complexes that are shown as spruce-fir forest on the vegetation cover type map. Therefore, although vegetation types associated with wetlands and riparian areas are described in this section and partially shown on the vegetation cover type map (MAP 5), the most accurate depiction of their aerial extent is shown on MAP 8.

3.3.2.1 Project Area (PA)

3.3.2.1.1 General Vegetation

The PA contains a variety of distinct vegetation/habitat types within the altitudinal variation of Two Elk Creek (9,000 feet near the western edge of the PA) and Battle Mountain, which forms the top ridge of Super, Pete's, and Commando bowls (11,600 feet). These vegetation community types serve a multiplicity of functions including habitat for wildlife, increased levels of biodiversity, recreation opportunities, improved water retention in watersheds, and aesthetic viewsheds. There are ten major vegetation community types that have been described within the PA. They include: 1) grassland/meadow, 2) mountain brush, 3) aspen forest, 4) aspen/conifer mixed forest, 5) lodgepole forest, 6) mixed conifer forest, 7) spruce-fir forest, 8) willow/riparian, 9) rock/scree slopes and, 10) special aquatic sites. Additionally, each of the conifer forest types have been further divided to distinguish savannahs, which have only scattered trees, from the primarily closed canopies of the other forested types. These types include lodgepole savannah, mixed conifer savannah, and spruce-fir savannah, and bring the total number of community types described for the PA to 13.

Vegetation cover types were delineated for the PA based on site visits, existing vegetation maps, the Forest Service Rocky Mountain Resource Information System (RMRIS) data base, and aerial photographs. A vegetation cover type map depicts the juxtaposition, relative size, and shape of the types (MAP 5). The total approximate acreage of each habitat type within the 4,300 acre PA, and the percentage of the area that each occupies, is shown in Table 3.7. The dominant habitat type within the PA is spruce-fir forest, followed by grassland/meadow and lodgepole forest types (24, 21, and 21 percent of the PA, respectively). The vast majority of herbaceous plant species identified were perennial grasses, sedges, and forbs; a complete list of the plant species observed is included with this Draft EIS as Appendix B, Table 1. The distribution, type, extent, and pattern of vegetation communities that have developed throughout much of the PA result in large part from extensive forest fires that occurred there around the turn of the century. In particular, the open meadows and sparsely forested savannahs that make up much of the vegetation in both Pete's and Super bowls are a consequence of the slow regeneration that has occurred since these fires.

3.3.2.1.1.1 Grassland/Meadow (GM)

This type is found interspersed with other vegetation types throughout the study area, and can have a very diverse species composition depending upon the elevation, aspect, and moisture regime of any given community. It is the second most extensive type found in the PA, and dominates large portions of Super Bowl, segments of Pete's Bowl, and much of the landscape surrounding Two Elk Creek and other drainages in the PA. The plant species which comprise this type vary from graminoid (grass and grass-like species) to forbs, but tend to be dominated more by graminoid species on the highest elevation slopes and on lower slopes with a west- or south-facing aspect. These areas are generally more xeric and/or exposed, creating conditions which tend to favor dominance by graminoid species and result in montane grasslands. In zones that are more mesic or less exposed, herbaceous forbs become a more dominant component of the community, which consequently develop meadow characteristics. It should be noted that the GM type describes two ends of a continuum; many of the areas within this type contain a combination of plant species described for the two extremes. Several of the GM areas delineated in Pete's and upper Commando bowls contain meadows that are mesic enough to develop jurisdictional wetlands. The source of water in these areas is usually either a spring, seep, or subsurface flow; the vegetation that occurs there tends to be very different from that found in the surrounding upland GM. Due to the overall similarity between these very mesic meadows and that found in the riparian areas, the vegetation in these zones is described below in the willow/riparian type, rather than in the GM type description.

Table 3.7. Vegetational cover types within the PA.		
Habitat Type	Area (acres)	Approximate Percent of PA
Forested Habitats		
Aspen Forest (AS)	200	5
Lodgepole Forest (LP)	892	21
Spruce-Fir Forest (SF)	1028	24
Mixed Spruce-Fir/Lodgepole Forest (MF)	488	11
Mixed Aspen/Conifer Forest (AC)	219	5
Lodgepole Savannah (LS)	102	2
Spruce-Fir Savannah (SS)	223	5
Mixed Conifer Savannah (MS)	85	2
SUBTOTAL	3,237	75
Nonforested Habitats		
Mountain Brush (MB)	34	0.8
Rock/Scree Slopes (RS)	44	1
Special Aquatic Sites (SAS)	0.83	<0.1
Grassland/Meadow (GM)	907	21
Willow/Riparian (WR)	76	2
SUBTOTAL	1,062	25
TOTAL	4,299 Acres	100 Percent

The grasslands found on the lower, more xeric slopes are dominated by grasses such as Thurber fescue (*Festuca thurberi*), Nelson needlegrass (*Stipa nelsonii*), short-leaved fescue (*Festuca brachyphylla*), alpine timothy (*Phleum commutatum*), slender wheatgrass (*Elymus trachycaulus*), spike trisetum (*Trisetum spicatum*), and bluegrasses (*Poa arctica*, *Poa* spp.). Dominant forbs in these zones consist of yarrow (*Achillea laurens*), Fendler meadow-rue (*Thalictrum fendleri*), silver lupine (*Lupinus argenteus*), cinquefoil (*Potentilla pulcherrima*), buckwheat (*Eriogonum umbellatum*), low goldenrod (*Solidago multiradiata*), and monument plant (*Frasera speciosa*). Common shrubs found in this type include currant (*Ribes wolfii*, *R. montigenum*), elderberry (*Sambucus microbotrys*), and golden aster (*Heterotheca villosa*). Grasslands located in upper Tea Cup Bowl are heavily dominated by several upland sedge species (*Carex foenea*, *C. rupestris*, *Carex* spp.), as well as Nelson needlegrass, spike trisetum, short-leaved fescue, and alpine timothy.

The slightly more mesic meadow communities often contain many of the grass species identified previously, but also have a greater abundance of dominant forb and shrub species. In addition to the grass and sedge species listed above, these meadow areas often contain brome grasses (*Bromopsis pumPELLIANA* and *B. canadensis*), fowl bluegrass (*Poa palustris*), wheatgrasses (*Elymus* spp., *Elytrigia* spp.), and elk sedge (*Carex geyeri*). Dominant forbs include yarrow, wild strawberry (*Fragaria virginiana*), showy daisy (*Erigeron speciosus*), Fendler meadow-rue, peavine (*Lathyrus* spp.), cinquefoil, silver lupine, Columbia groundsel (*Senecio integerrimus*), thistle (*Cirsium* spp.), Richardson geranium (*Geranium richardsonii*), goldenrod, and Geyer's onion (*Allium*

geyeri). Common shrub species found in these zones include golden aster, currant, bearberry honeysuckle (*Distegia involucrata*), and elderberry.

Although there are no true alpine areas (as defined by zones that occur above treeline) in the PA, several of the meadows found in the upper portions of Super, Pete's, and Commando bowls, as well as those located along the ridges and saddles which divide the PA, resemble alpine communities based on the addition of several subalpine and alpine plant species. These areas are dominated by several grass, sedge, and rush species including tufted hairgrass (*Deschampsia cespitosa*), alpine bluegrass (*Poa alpina*), Drummond rush (*Juncus drummondii*), various sedges, spike trisetum, timothy, and other bluegrasses. Dominant forbs include mountain harebell (*Campanula rotundifolia*), speedwell (*Veronica nutans*), penstemon (*Penstemon whippleanus*), prostrate sabbaldia (*Sibbaldia procumbens*), peregrine and one-flowered fleabane (*Erigeron peregrinus*, *E. simplex*), buttercup (*Ranunculus* spp.), yarrow, goldenrod, and Geyer's onion.

3.3.2.1.1.2 Willow/Riparian (WR)

This vegetation type occurs along all major and most minor stream and spring channels in the PA. Willows are densest along Two Elk Creek, especially at the eastern edge of the PA, near the headwaters of the creek. Willows are often absent from the higher elevation riparian zones surrounding the channels that drain each of the bowls and in seep/spring areas found throughout the PA. The willow shrub communities adjacent to Two Elk Creek and those extending up the tributary drainages in the adjacent bowls are dominated by an overstory of several willow species (*Salix brachycarpa*, *S. monticola*, *S. planifolia*); dominant understory vegetation consists of tall bluebells (*Mertensia ciliata*), heartleaf bittercress (*Cardamine cordifolia*), Hornemann's willow-herb (*Epilobium hornemannii*), arrowleaf groundsel (*Senecio triangularis*), monkshood (*Aconitum columbianum*), Barbey's larkspur (*Delphinium barbeyii*), various sedges (*Carex* spp.), and longstyle and arctic rushes (*Juncus longistylis*, *J. arcticus*).

In riparian areas lacking a willow overstory, the vegetation is similar to that described above, but tends to be dominated by five species in particular: tall bluebells, heartleaf bittercress, arrowleaf groundsel, Hornemann's willow-herb, and brook saxifrage (*Micranthes odontoloma*), often in association with the other species listed above. Seep and spring areas, especially those located in the meadow areas of upper Pete's and East Pete's bowls are dominated with similar forb species, but with the addition of tufted hairgrass and bog bluegrass (*Poa leptocoma*). Other forbs common to seep/spring areas include marsh marigold (*Psychrophila leptosepala*), monkeyflower (*Mimulus tilingii*), elephanthead (*Pedicularis groenlandica*), alpine groundsel (*Ligularia amplexans*), and buttercup species. Often this type occurs as a complex of upland meadow, forested wetland, and spring/seep areas.

Depending upon the season, amount of recent precipitation, and total amount of precipitation for that year, special aquatic sites (SAS) within the PA may exist as shallow ponds, vegetated shallows, mud flats, or sedge meadows. Several of these sites occur along a bench on the south side of Two Elk Creek, that coincides with the lower portion of Commando and East Pete's bowls. Commando Pond is the largest of these, and generally has open water throughout the season. Most of the others along that bench exist as sedge meadows for much of the year. These areas tend to be heavily dominated by sedges (*Carex aquatilis*, *C. nebraskensis*, *C. lasiocarpa*, and *Carex* spp.), Canada reedgrass (*Calamagrostis canadensis*), and Kellogg knotweed (*Polygonum polygaloides* ssp. *kelloggii*). Please refer to the Wetlands and Wildlife sections of this Draft EIS for more detailed information regarding other functions of these and other wetland types within the PA.

3.3.2.1.1.3 Aspen Forest (AS)

Most of the pure aspen (*Populus tremuloides*) stands within the PA are located on the north side of Two Elk Creek and west of the existing China Bowl base terminal, although several small stands occur in both Super and Pete's bowls. Due to its clonal nature, aspen forests tend to be comprised of a number of stands, which are often separated by small gaps. As a result, aspen forests are often much more open than surrounding forested types (with the exception of the savannah types described below). The patchy nature of the aspen overstory lends itself to a particularly dense understory growth, dominated by Canada reedgrass, bromegrasses, Fendler meadow-rue, saw groundsel (*Senecio serra*), thickspike wheatgrass (*Elytrigia dasystacha*), peavine, alpine timothy, cow parsnip (*Heracleum lanatum*), yarrow, showy daisy, leafy aster (*Aster foliaceus*), elk sedge, and yarrow. Common shrubs occurring in this type include currant, Oregon grape (*Mahonia repens*), snowberry (*Symphoricarpos rotundifolius*), golden aster, and mountain lover (*Paxistima myrsinites*). There were no old-growth aspen stands identified within the PA.

3.3.2.1.1.4 Lodgepole Forest (LP)

The LP type is the third-most-prevalent vegetation cover type within the PA. It is characterized by a dense 60- to 80-year-old lodgepole pine (*Pinus contorta*) overstory, with an understory that is often sparse or lacking in diversity, particularly in the drier forested areas. The understory in dry lodgepole stands is primarily dominated by grouse whortleberry (*Vaccinium scoparium*), heartleaf arnica (*Arnica cordifolia*), and elk sedge; other common species include lupine, blunt sweet cicely (*Osmorhiza depauperata*), one-sided wintergreen (*Orthophila secunda*), green wintergreen (*Pyrola chlorantha*), millet woodrush (*Luzula parviflora*), and subalpine Jacob's ladder (*Polemonium pulcherrimum* ssp. *delicatum*). Common shrubs include currant and common juniper (*Juniperus communis*). Moister areas in lodgepole pine forests tend to be less dominated by grouse whortleberry, and include the addition of Canada reedgrass as a major component of the species composition in these zones. There were no old-growth lodgepole pine stands identified within the PA.

3.3.2.1.1.5 Spruce-Fir Forest (SF)

Of the 1,028 total acres of mixed Englemann spruce (*Picea englemannii*) and subalpine fir (*Abies lasiocarpa*) forests covering the PA, approximately 697 acres (67 percent) have been identified as old-growth forest. This comprises about 21 percent of the forested habitats within the PA. Much of the remaining 331 acres are mature spruce-fir forest, but do not meet the current technical description of old-growth forests in Region Two (Mehl 1992). To be identified as old-growth, stands are scored based on the presence of a number of required attributes, including stand age. The other attributes include: large trees for species and site; variation in tree size and spacing; standing and down dead trees; decadence in the form of broken or deformed tops or bole and root decay; multiple canopy layers; gaps in the tree canopy and understory patchiness; and, stand size (Mehl 1992). Within the PA, site visits, RMRIS stand data, and existing vegetation technical reports were utilized to compile data that were analyzed and scored on a stand by stand basis. These scores were then used to determine whether a given stand met the minimum requirements to be identified as old-growth (Buell, *pers. comm.*, 1994; USDA-FS 1994c). Stands that met some of the requirements, but did not meet the minimum age criteria were identified as recruitment stands, which should meet old-growth criteria within the next 30 to 50 years, if no further disturbance occurs.

In the PA, old-growth forests cover most of Commando, East Pete's, and upper Super bowls, as well as the ridge of Battle Mountain that connects these areas. These are essentially two large, nearly contiguous blocks of old-growth forest, although the block which follows the ridgeline of Battle Mountain is much narrower than the block

in Commando Bowl. For more detail on the importance and function of old-growth forests within this ecosystem, please refer to the discussion in the Biodiversity section of this chapter. The understory vegetation present in old-growth stands tends to be somewhat more diverse than that found in non old-growth stands. The differences are particularly striking in drier spruce-fir forests, as the understory in both old-growth and non old-growth stands is substantially more diverse in areas with more moisture.

The understory in dry spruce-fir forests is heavily dominated by heartleaf arnica, grouse whortleberry, and elk sedge. Other common forb species include silver lupine, subalpine Jacob's ladder, one-sided and green wintergreen, blunt sweet cicely, and parrot's beak (*Pedicularis racemosa* ssp. *alba*); currant is the only shrub that occurs somewhat commonly. The understory in dry old-growth stands contains the species listed above, but has the addition of (and a concomitant decrease in dominance of arnica, whortleberry, and elk sedge) alpine groundsel, tall bluebells, millet woodrush, Rydberg arnica, rattlesnake-plantain (*Goodyera oblongifolia*), and Richardson geranium.

The understory of wet spruce-fir forests is more diverse in both old-growth and non old-growth stands, and ranges from mesic forests to true forested wetlands. Much of the upper portion of Commando and East Pete's bowls contain extensive forested wetlands, and pockets of mesic forest are persistent along the ridge of Battle Mountain from Commando Saddle to the top of Super Bowl. Areas with small pockets of moist forest understory, commonly found in old-growth stands of the PA around the roots of downed trees, tend to be dominated by alpine groundsel, tall bluebells, millet woodrush, Rydberg arnica, Drummond rush, and buttercup. The understory in more mesic forest to true forested wetlands is dominated by marsh marigold, mosses, tufted hairgrass, arrowleaf groundsel, heartleaf bittercress, brook saxifrage, monkeyflower, little gentian (*Gentianella acuta*), Hornemann's willow-herb, Canada reedgrass, Drummond rush, bog bluegrass, various sedges, willows (*Salix* spp.), grass-of-parnassus (*Parnassia fimbriata*), cowbane (*Oxypolis fendleri*), bishop's cap (*Mitella pentandra*), one-flowered wintergreen (*Moneses uniflora*), and chickweed (*Stellaria* spp.). Although not as dominant in the community, numerous other plant species were also commonly observed, indicating the high level of diversity present in wet spruce-fir forests. A more complete list of plants observed within this type is found as part of Appendix B, Table 1.

3.3.2.1.1.6 Mixed Lodgepole Pine/Spruce-Fir Forest (MF)

This type consists of an overstory that is a combination of each of the three conifers found within the PA. It is generally found in transition areas between pure lodgepole pine and spruce-fir stands. The understory can also be a mix of the dominant species found in each type, although there is significant overlap in understory species between the two types. In particular, heartleaf arnica, grouse whortleberry, currant, elk sedge, and lupine tend to dominate, with a variety of other forb species occurring commonly.

3.3.2.1.1.7 Aspen/Conifer Mixed Forest (AC)

Mixed aspen and conifer (usually lodgepole pine but may also contain Englemann spruce and subalpine fir) forest within the PA occurs mostly on the north-facing slopes above Two Elk Creek, in areas where aspens are currently invading the surrounding lodgepole forest. The understory is often heavily dominated with Canada reedgrass, currant, heartleaf arnica, elk sedge, and an assortment of less common forb species. The dominance by reedgrass is indicative of the more mesic nature of these communities, which results in part from the aspect.

3.3.2.1.1.8 *Lodgepole Savannah (LS)*

This type occurs as scattered small patches through Super and Tea Cup bowls, and one area in Pete's Bowl. These patches lacked the canopy cover (often less than 5 percent) to be described as forest, but had too many trees to be lumped into type GM. These stands have a very open, park-like aspect with a canopy dominated by lodgepole pine trees. However, rather than the understory described for type LP, this type has an understory that resembles the meadow community described previously under type GM.

3.3.2.1.1.9 *Spruce-Fir Savannah (SS)*

SS is most extensive in the upper portions of both Pete's and Super bowls, but also occurs in the area just west of Commando Saddle, along the ridge. This type developed as a result of sparse regeneration (likely due to harsh environmental conditions found at these elevations) of spruce-fir forest from turn-of-the-century fires. It has a similar percentage of overstory canopy cover and overall appearance as that described for type LS. The understory in these areas ranges from that described for dry spruce-fir forests (i.e., dominated by grouse whortleberry and heartleaf arnica), to resembling that described previously for meadow communities in type GM. The understory in mesic areas of the type SS is similar to that described above for other forested and non-forested wet areas (see type WR).

3.3.2.1.1.10 *Mixed Savannah (MS)*

The MS type is very similar to the savannah types described previously, but the overstory is comprised of both lodgepole and spruce-fir trees. The understory resembles that described above for the SS type, but typically with a higher proportion of Canada reedgrass. This type is mainly present near the bottom of Commando Bowl, and on the ridge which separates Pete's and Super bowls.

3.3.2.1.1.11 *Mountain Brush (MB)*

MB occurs only on south-facing slopes above Two Elk Creek at the lowest elevation in the PA, and is thus limited to the area near the western edge of the CAT III area border. The vegetation of MB consists primarily of shrubs, grasses, and forbs, with individual aspen and/or conifer trees distributed sparsely throughout. Common shrubs include currant, snowberry, serviceberry (*Amelanchier alnifolia*), sagebrush, snakeweed, golden aster, and Oregon grape; dominant grasses include thickspike wheatgrass, slender wheatgrass, brome grass, Thurber fescue, short-leaved fescue, and Nelson needlegrass. Forbs present include buckwheat, pussytoes (*Antennaria* spp.), Fendler meadow-rue, yarrow, monument plant, dragonhead (*Dracocephalum parviflorum*), and thistle (*Cirsium* spp.).

3.3.2.1.1.12 *Rock/Scree (RS)*

Although not strictly a vegetation type, RS is nevertheless a habitat type which occurs throughout the PA. It should be noted that several of the prominent rock outcrop features found in the PA, such as those above the confluence of Super Bowl and Two Elk Creek, rock bands along the upper wall of Super Bowl, and the headwall in the upper portion of East Pete's Bowl do not appear on the vegetation cover type map (MAP 5). These outcrops tend to have a greater vertical aspect than horizontal, and thus tend to be under-represented on the vegetation maps. However, these areas offer unique habitat for a variety of plants, birds, and mammals, and should be noted along with the SC areas that are depicted on the vegetation map. Although sparsely vegetated overall, several species occur commonly in this type: mountain lover, currant, spotted saxifrage (*Cilalaria*

austromontana), arctic willow (*Salix arctica*), and twinflower (*Linnaea borealis*). The headwall area of East Pete's Bowl also contains several spring and seep areas, resulting in a flora similar to that described above for wet spruce-fir forests.

3.3.2.1.2 Noxious Weeds

Much of the study area is currently free of most introduced weed species of concern. However, several sites within the study area have been invaded by yellow toadflax (*Linaria vulgaris*), a noxious weed covered by the Colorado Weed Management Act (CWMA). These areas tend to be close to previously developed areas of the resort, near the south end of the PA in close proximity to existing timber roads, or in areas that are currently being grazed by livestock. No other plant species that are currently listed as a forest noxious weed are known to occur within the PA. The CWMA in 1990 requires the control of "undesirable plants," as designated by the state of Colorado and local governing bodies, that constitute a threat to the continued economic and environmental value of the lands of the state (State of Colorado 1990, § 35-5.5-102). The act requires the control of noxious weeds on both public and private lands.

3.3.2.1.3 Plant Species of Special Concern

The Vail SUP area includes habitats that could potentially support federally listed candidate and Region Two Forest Sensitive plant species. Most of these plants have special habitat requirements. Disturbance of the habitat of threatened or endangered species is prohibited by the ESA (1973, as amended), although it may be permitted if a series of steps requiring avoidance, mitigation, and/or compensation is followed. Federal Table 2.11. and Forest Sensitive species are not protected by the ESA, but are managed under Forest Service policy. Once identified, sites that support sensitive, threatened, or endangered plants are given special consideration. It was determined by the FWS that no federally listed threatened or endangered plant species are likely to occur in the PA (Rose 1994). A list of the federal candidate, Region Two Forest Sensitive, and state rare plant species that may occur within the Vail Ski Area SUP area was developed in consultation with the FWS, Forest Service, and Colorado Natural Heritage Program. A Biological Evaluation assessing potential impacts to federal candidate and Forest Sensitive species has been completed as part of the Forest Service requirements and is on file with the appropriate federal and state agencies.

Pre-proposal field surveys for candidate and Forest Sensitive species were conducted by Dames and Moore, and Western Ecosystem consultants. Pioneer Environmental Services also conducted field surveys during June, July, and August of 1994 on sites within the proposed development area where elements of the alternatives are planned. Areas were visually inspected during methodical searches of zones that would potentially be disturbed. A list of all species encountered in each area was made, and surveys were intensified in areas identified as potential habitat for candidate, Forest Sensitive, or state rare species. No candidate, Forest Sensitive, or plant species listed by the Colorado Natural Heritage Program were actually found in the portions of the PA that were surveyed. However, appropriate habitat for one candidate species and one state listed species was found in the PA. These two plants are discussed below.

3.3.2.1.3.1 Brownie lady slipper (*Cypripedium fasciculatum*)

Although traditionally placed in the orchid family, the most recent Colorado flora (Weber 1987) places brownie lady slipper in its own family, the Cyripediaceae. All members of this family are considered rare and potentially endangered (Weber 1987; Weber 1976; USDA-FS 1991a; Cronquist et. al. 1977) wherever they occur. Brownie lady slipper is a federally listed Category 2 (C2) candidate species and a Region Two Forest Sensitive species.

The species is distributed from southern British Columbia to central California, and from Montana south to Colorado. Its range encompasses mountainous portions of Utah, Wyoming, Idaho, Colorado, Washington, and Oregon. Brownie lady slipper occurs from approximately 7,800 to 10,000 feet in elevation, and is considered to occur in limited and disjunct populations throughout its range (USDA-FS 1991a). The species is an herbaceous perennial which may flower anytime from May-July, depending on the elevation and latitude. It should be noted that populations often reproduce rhizomatously, rather than through seed production, and that populations may or may not flower in any given year, depending (most likely) upon the environmental conditions. Therefore, surveys with negative results may indicate only that the plants are not flowering that particular season, and not that they do not occur at that site (Phelps, *pers. comm.*, 1995).

In Colorado, where the species is considered rare and vulnerable, it occurs on subalpine slopes, generally in dry to moist areas under spruce-fir or lodgepole pine forests, and occasionally in forest openings (Weber 1987). It has been identified on the White River, Medicine Bow, Routt, and Arapaho-Roosevelt NF's in Colorado. In Wyoming, the species has also been identified in riparian shrublands (Fertig et al. 1994); in Utah, *C. fasciculatum* has been found along shaded streams and in dry duff under spruce-fir and lodgepole pine forests (Atwood et al. 1991). The Forest Service (USDA-FS 1991a) listed timber management practices as the biggest threat to the species, followed by livestock grazing and degradation of riparian areas. Identification and subsequent protection of essential habitat was determined to be the most important step necessary to protect species viability.

The largest known population of brownie lady slipper in the regional area occurs on the west side of Green Mountain Reservoir, between 8,500 and 10,000 feet in elevation. During the summer of 1995, more than 5000 individuals were located in a 4-square-mile area, typically on east- or northeast-facing slopes. Most of the population occurred in the understory of dry and relatively closed-canopy lodgepole pine or spruce-fir stands, associated with heartleaf arnica and whortleberry. However, some individuals were observed growing in partial shade under more open canopy stands (Phelps, *pers. comm.*, 1995). In the Vail LA, *C. fasciculatum* has been identified from the Timber Creek area approximately 0.25 miles east of Two Elk Pass, which forms a portion of the boundary of the PA. The population there occurs in the understory of fairly dense and dry spruce-fir and lodgepole pine forests. In 1991, this population was estimated to consist of more than 300 individuals. Although the species was never identified within the PA, there is appropriate habitat present throughout much of the proposed development area. Given the proximity of the PA to known *C. fasciculatum* populations and the availability of appropriate habitat, the species may potentially occur within the CAT III area.

3.3.2.1.3.2 Northern twayblade (*Listera borealis*)

Although the northern twayblade has no federal or forest status, it is listed as a rare species with S1 status by the state of Colorado, and is considered very rare and endangered by Weber (1976). It is a member of the orchid family (Orchidaceae), of which many species are considered rare and endangered due to their very specific habitat requirements and overall rarity (Weber 1976; Colorado Native Plant Society 1989). In Colorado it is known to occur in moist spruce-fir forests from Chaffee, Gunnison, Boulder, Clear Creek, and Summit Counties (Weber 1987; 1991). Northern twayblade tends to inhabit wet to moist subalpine forests, and generally occurs in shady areas under the forest canopy. It flowers from July-August, and often occurs as a few northern twayblade individuals in association with a much larger surrounding population of heart-leaved twayblade (*Listera cordata*), a closely related species of orchid.

In the Vail area, *Listera borealis* is known to occur in the Timber Creek area just east of the PA, where three individuals were identified in 1991 along Timber Creek at 9,250 feet in elevation. These three individuals were

located in a larger population of heart-leaved twayblade in a mesic, shady spruce-fir forest (Dames and Moore 1993). Similar habitats at higher elevations occur throughout the proposed development area, but particularly in Commando and East Pete's bowls. No individuals have been identified within the PA; however, it should be noted that due to their diminutive stature and tendency to occur in conjunction with very similar species, they can be difficult to identify without very thorough searches of the appropriate habitat. Given this and the fact that heart-leaved twayblade was found in the PA, the species may potentially occur within the CAT III area.

3.3.2.2 Landscape Area (LA)

The RMRIS data base was utilized to determine most of the vegetation patterns currently found in the LA (approximately 41,178 acres). There are ten vegetation/habitat types delineated within the LA, encompassing both public and privately owned lands (MAP 6). Further, the vegetation cover type map also portrays wet or riparian areas (marked 'w'), old-growth (marked 'og'), and recruitment (marked 'r') stands of spruce-fir, lodgepole pine, and aspen found within the LA. Of the ten types described for the LA, seven are identical to their counterparts described in the PA. They include SF, GM, LP, AS, MB, SC, and SAS. It should be noted that the mixed conifer and savannah types are not delineated as separate types at this scale but are aggregated into the broader types listed above. Further, mesic meadows are delineated separately into the type WM, and not aggregated with the more xeric type GM. There are also two new types delineated at this scale: urban or developed lands (U) and Douglas fir (DF) forests.

The acreage of each type for both public and private lands, and the acreage of wet meadow, old-growth, or recruitment stands in each are listed in Table 3.8. Old-growth and recruitment stands were determined by using the Forest Service Stage II stand data for the area, and applying criteria developed by Mehl (1992) for each forest type. Each stand was then scored, and the determination made if it met the minimum criterion for either recruitment or old-growth status.

3.3.2.2.1 Old-growth Spruce-fir Forest (SF)

Of the 13,675 acres of spruce-fir forest in the LA, approximately 5,294 acres (39 percent) were delineated as potential old-growth or recruitment stands (3,113 and 2,181 acres, respectively). The vast majority of this acreage occurs either within or directly adjacent to the PA (MAP 6). Additional smaller stands occur around the previously developed ski terrain in the CAT I and II areas of the Vail Ski Area. This area comprises approximately 10 percent of the forested habitat types in the LA. Based on analysis of aerial infrared photos, some of the private land in the SW portion of the LA could undoubtedly be classified as old-growth spruce-fir forest. However, because these areas are privately owned, the decision of whether they are managed or maintained in their current condition rests with the landowner and existing county regulations. Therefore, this area was not counted in the total old-growth estimate, which may make the analysis which follows in Chapter 4 somewhat conservative.

3.3.2.2.2 Grassland/Meadow and Wet Meadow (GM and WM)

As noted above, the type GM was delineated separately from the more mesic type WM. For the LA, the type GM portrays not only native and naturally occurring GM areas, but also seeded ski trails in the developed portion of Vail Ski Area. The type WM is used to delineate the more mesic wet meadow and riparian areas that were described previously for the PA under type WR.

Table 3.8. Vegetational cover types and acreages within the LA

Vegetation Type	National Forest System Land (acres)			Private Land (acres)	Grand Total (acres)	Percent of LA
	Total Area	Old-Growth ¹	Recruitment ¹			
Aspen Forest (AS)	5,342	318	99	1,178	6,520	16
Spruce-Fir Forest (SF)	12,952	3,113	2,181	723	13,675	33
Lodgepole Pine Forest (LP)	10,036	35	362	2,351	12,387	29
Douglas Fir Forest (DF)	98	0	0	0	98	0.24
Mountain Brush (MB)	963	-	-	262	1,225	3
Grass Meadow (GM)	4,867	-	-	16	4,883	12
Wet Meadow (WM)	225	-	-	188	413	1
Open Water (SAS)	53	-	-	0	53	0.13
Scree (S)	89	-	-	262	351	1
Urban (U)	108	-	-	1,466	1,574	4
TOTAL AREA	34,733	3,466	2,642	6,446	41,179	100

¹ Old-Growth and Recruitment designations apply only to forested vegetation types. The acreage reported for Old-Growth and Recruitment stands is a subset of the total area and is included in that figure.

3.3.2.2.3 Lodgepole Pine Forest (LP)

The description of lodgepole pine forest in the LA is the same as that described previously for the PA, although the PA had only recruitment stands delineated, as no old-growth LP stands occur there. There are a total of 12,386 acres of LP forest within the LA, of which only 397 acres (3 percent) were delineated as potential old-growth or recruitment stands (35 and 362 acres, respectively). Only one of these stands is located within the PA, and the remainder are highly disjunct across the LA.

3.3.2.2.4 Aspen Forest (AS)

Within the LA, the description of aspen forests is exactly the same as that given previously for the PA, with the addition of several tracts of old-growth and recruitment aspen forest. They occur south of the PA, adjacent to the Lime Creek drainage. Of the approximately 6,520 acres of aspen within the LA, 417 acres (6 percent) have been delineated as potential old-growth or recruitment stands (318 and 99 acres, respectively). The stands form a contiguous forest of recruitment and old-growth stands, broken by an open meadow area.

3.3.2.2.5 Special Aquatic Sites (SAS)

The Black Lakes and several smaller areas of open water, including some ponds in the developed ski area have been designated SAS. Most also have either wetland or riparian zones adjacent to them. This habitat type is rare throughout both the PA and LA.

3.3.2.2.6 Douglas Fir Forest (DF)

This type did not occur within the PA, and so was not described previously. Two small stands, totaling 98 acres, were delineated near the western edge of the LA. They are characterized by an overstory of Douglas fir (*Pseudotsuga menziesii*), and an understory dominated by mountain clover, heartleaf arnica, and elk sedge.

3.3.2.2.7 Urban Land (U)

Urban and developed land dominates the edges of both the north and west borders of the LA. Urban land is generally private land that has already been developed into houses, commercial buildings, civic and town buildings, golf courses, roads, and/or parking lots. Occasionally, urban lands include small areas of natural forest and vegetation types. The land covered by the railroad tracks along the Eagle River is also part of this type, as are several public camping areas near the river. Portions of the towns of Vail, Minturn, Gilman, and Red Cliff are covered by this type, as are some undeveloped land tracts that already have planned development.

3.3.2.3 Regional Area (RA)

The vegetation types delineated at the RA are more general than those presented for either of the two analysis areas. The depiction of vegetation at this more general level of analysis is based upon digitization of an existing map (MAP 5), which covers a total of 304,863 acres. Table 3.9 presents the six vegetation types delineated, and the acreage of each within the RA. Of the six, only four (AS, SF, MB, and LP) are analogous to types described previously for the PA and LA. The types alpine (AL) and Gambel oak (GO) do not occur in either of the two previous levels, and thus have not yet been described.

Almost two-thirds of the RA (63 percent) is covered by either spruce-fir or lodgepole pine forest (46 and 17 percent, respectively). Much of the remaining area is covered by alpine tundra, followed by mountain brush, aspen, and a small stand of Gambel oak.

Table 3.9. Vegetational cover types within the RA.

Vegetation Type	Area (acres)	Percent of RA
Aspen Forest (AS)	32,019	11
Alpine Tundra (AL)	46,347	15
Spruce-fir Forest (SF)	140,993	46
Lodgepole Pine Forest (LP)	50,790	17
Mountain Brush (MB)	33,983	11
Gambel Oak (GO)	731	0.2
TOTAL	304,863	100

Alpine tundra (AL) areas are dominated by slow-growing cushion and mat plants that are adapted to survive the extreme environmental conditions which characterize this ecosystem. True alpine zones occur above treeline (generally 10,500 to 12,000 feet in Colorado), and often have extensive areas that are covered with scree and

talus slopes with sparse vegetative cover. The vegetation consists primarily of upland sedges, grasses, and short-statured perennial forbs.

Gambel oak (GO) forms a scrub woodland with an overstory of Gambel oak (*Quercus gambellii*), chokecherry (*Prunus virginianus*), serviceberry, snowberry, and wood rose. The understory is a mix of herbaceous forbs such as Porter lovice (*Ligusticum porteri*), Fendler meadow-rue, vetch (*Vicia americana*), and bedstraw (*Galium boreale*). Upland sedges and grasses also comprise a significant portion of the dominant vegetation.

3.3.3 WETLANDS

3.3.3.1 Introduction

Waters of the US, including wetlands, receive federal protection under Section 404 of the Clean Water Act (1977, as amended), and fall under the regulatory authority of the Army Corp of Engineers (ACOE). Wetlands are defined as "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted to life in saturated soil conditions" (*Federal Register* 1980). The three parameters that must be met in order for a site to be classified as a jurisdictional wetland include: 1) the presence of hydric soils; 2) the dominance of hydrophytic plants; and, 3) the presence of wetland hydrology, upon which the first two are dependent. The ACOE has regulatory authority over dredge and fill activities that occur in wetlands.

Special aquatic sites (SAS) are also protected by the Clean Water Act and include ponds, streams, and springs. These are often not classified as wetlands because they may lack one or more of the required parameters; however, SAS are often surrounded by jurisdictional wetlands.

3.3.3.2 Delineation Methodology

Existing technical reports (Dames and Moore 1993), aerial infrared photos, and consultation with VA planners were utilized to make a preliminary identification of wetland resources within the PA. Subsequent ground truthing and further wetland identification occurred throughout the 1994 field season by Pioneer wetland scientists. Due to the size of the PA and the extent of the wetland and riparian resources in areas with no proposed disturbance, three different levels of wetland identification and mapping were utilized. As specified by the ACOE (Claffey, *pers. comm.*, 1994), the intensity of wetland mapping involved three levels, depending on the location of each wetland and its proximity to a proposed disturbance.

Level 1 required identifying and flagging wetlands in the field and then having that land area surveyed. Level 2 involved identification and mapping of wetlands, including ground truthing where proposed development upslope from them could potentially produce indirect adverse impacts. Level 3 required that all remaining wetlands within the proposed PA be identified from aerial photography, visited on the ground and delineated on an appropriate map.

Each wetland and SAS was mapped, and its size, type, and current condition were noted. Wetland boundaries were determined following the procedure outlined in the ACOE 1987 manual (Wetland Training Institute 1991), using the three-parameter method. Data on these parameters (plants, soils, and hydrology) were collected at each wetland and recorded on delineation forms (see Appendix C). A combination of aerial photography and 1-inch to 400-foot scale base maps were used to depict wetland location, size, and shape as accurately as possible.

Approximately 223 acres of wetlands were mapped using the methods described above. Wetlands in the PA were grouped into eight wetland complexes: Two Elk, Commando, East Pete's, Pete's, Super, Super West, Lower Sun Down, and Tea Cup (MAP 4). Wetlands were grouped into sub-systems based on geographic proximity, which usually indicated hydrologic linkage. Wetland acreage totals by type and sub-system are presented in Table 3.10. The functional values of the wetlands found within the PA are discussed in the 404 (b)(1) Alternatives Analysis, required by the ACOE for individual permits. It will be submitted to the ACOE prior to the issuance of the ROD.

Table 3.10. Delineation of wetlands in the PA

PA Wetlands Sub-system	Classification in Acres						
	Channels	Riparian Communities	Forested Seep	Sub-irrigated Meadow	Seep/Spring Complexes	Snowbed Complexes	Total
Two Elk	.34	25.14	0	3.18	.28	0	28.94
Commando	.20	9.00	130.31	.54	.11	0	140.16
East Pete's	.19	2.50	12.54	.06	.50	8.12	23.91
Pete's	1.39	2.91	1.55	.59	.94	7.86	15.24
Super	.22	2.55	0	.29	1.02	0	4.08
Super West	.04	.64	0	0	1.33	0	2.01
Lower Sun Down	.13	4.84	0	1.90	.05	0	6.92
Tea Cup	.14	1.40	0	0	.05	0	1.59
Total	2.65	48.98	144.40	6.56	4.28	15.98	222.85

3.3.3.3 Wetland Classification

The Cowardin Classification System (Cowardin et al. 1979) was used to classify all jurisdictional wetlands and waters of the U.S. within the PA. This system was developed for use nationwide in inventorying wetlands and waters of the U.S., and is used to classify wetlands ranging from marine tidal zones to ephemeral springs. Although useful as a tool for standardized wetland classification schemes, the Cowardin Method, due to its broad-scale applicability, classified all jurisdictional wetlands within the PA as palustrine systems. Perennial and ephemeral ponds, such as the SAS found within the PA, are included in the palustrine system. Streams and channels, which are defined as waters of the U.S. rather than jurisdictional wetlands, are classified as riverine systems by Cowardin et al. (1979). To distinguish among wetlands within the PA that are classified identically by Cowardin et al., a finer scale classification system was developed to describe them. Each of these specific wetland resource types are described below.

Wetland and SAS types in the PA were classified according to similarities such as vegetation cover (both canopy and understory) and source of hydrology (MAP 5). Jurisdictional wetland types described include riparian communities (R), forested seep complexes (F), subirrigated meadows (M), seep/spring complexes (S), and snowbed complexes (B). Of these five types, S and B occur as a mosaic of small upland and wetland patches which are not easily depicted on maps. Although not jurisdictional wetlands, the types designated channels (C),

lacking hydric vegetation and/or soils, and SAS are given special consideration as waters of the U.S., and are therefore subject to protection under the Clean Water Act. The acreages of each type, and an identification code unique to each wetland, are presented in Tables C.1 through C.8 of Appendix C.

3.3.3.3.1 Channels

Channels in the PA contain small, montane watercourses. Snowmelt constitutes the principal source of water, and consequently, flows are higher during the spring runoff period. Perennial flows are maintained in some streams by springs and seeps, although most have only ephemeral or intermittent flows. Channels lack riparian vegetation and/or hydric soils, and therefore meet the definition of a water of the U.S., rather than of a jurisdictional wetland. Channels have a defined bed and bank, created by flowing water, and connect other elements of the wetland network by collecting and moving surface water to streams and wetlands. They are classified by Cowardin et al. (1979) as riverine systems.

3.3.3.3.2 Riparian Communities

Riparian communities are predominantly associated with stream networks, but may also occur adjacent to larger channels. Most streams support riparian zones on either side, which are classified by Cowardin et al. (1979) as palustrine systems. Thus, most streams have both a riverine and a palustrine component. Little vegetation is found in the stream proper. The extent of the riparian area is largely dependant on the topography surrounding the streambed and the quantity of water present in the stream. Willows (*Salix* spp.) are a dominant species in only a few of the riparian communities in the study area, most notably those along Two Elk Creek and the lower reaches of the main Super Bowl drainage. Several species of willows, usually distinguished by differences in canopy height, may exist along the same stream, adding structural diversity to the community. Alder (*Alnus incana*) is also present in some riparian communities. Riparian communities dominated by thick willow stands usually have limited understory. Open or non-woody riparian communities are dominated by the forbs arrowleaf groundsel, heartleaf bittercress, tall bluebell, and brook saxifrage. Other components of this system include graminoids such as tufted hairgrass, bog bluegrass, arctic rush, and various sedge species.

3.3.3.3.3 Forested Seep Complexes

Forested seeps are a relatively unique wetland type that is particularly well represented by complexes located in both Commando and East Pete's bowls. Seeps and springs at groundwater discharge sites are sources of perennial saturation, which create wetlands in comparatively low areas that are surrounded by uplands. The vegetation canopy is dominated by conifers, including subalpine fir and Engelmann spruce. The understory is heavily to somewhat shaded by the conifers, resulting in a distinctive plant community that may include a number of species that are rare or absent outside of these wetlands. These plant communities were detailed in the description of wet spruce-fir forests in the Vegetation section above and may also include several uncommon orchids and other species that have adapted to the specialized environments of relatively low light and high moisture regimes. Hydric soils may be present but are often covered by a deep layer of humus from decaying needles.

3.3.3.3.4 Sub-irrigated Meadow Wetlands

Meadow wetlands are characterized by a predominance of herbaceous hydric vegetation. Dominant species include Canadian reedgrass, tufted hairgrass, several species of sedges, and arctic rush. Snowmelt, streamflow, springs, and seeps all may disappear from above-ground channels (a common phenomenon in the PA) to

contribute to subsurface flows which can result in a high water table in some topographical depressions. As a result, these depressions can often have a seasonal hydric water regime. The largest sub-irrigated meadow wetland also has a dominant scrub-shrub willow component (MAP 5). Shrub-scrub (willow) wetlands are dominated by several species of willows (*Salix geyeri*, *S. planifolia*, *S. monticola*, and *Salix* spp.) with a sparse understory of grasses, sedges, and forbs.

3.3.3.3.5 Seep/Spring Complexes

Seep/spring complexes identify groundwater discharge zones in the PA. This type is usually very small (<0.01 acre), but may also occur as a larger complex of several seeps or springs in one area. Seeps and springs occur very commonly throughout the PA, but are especially concentrated in the mid- to lower elevations of all the bowls. The source of water for these sites is principally snowmelt from the upper reaches of the bowls, which generally results in a seasonally higher rate of flow. However, many of the seeps and springs flow all season, or start again after summer precipitation events. Soils in and around these sites are generally very thin and may also be rocky. The vegetation in these areas is dominated by arrowleaf groundsel, heartleaf bittercress, monkeyflower, chiming bells, and often mosses.

3.3.3.3.6 Snowbed Complexes

Snowbed complexes are generally very small wetlands (often only a few square feet) created by the slow melting of deep snow accumulations which are dispersed throughout a surrounding matrix of uplands. Because of these characteristics, it proved difficult to accurately identify the wetland/upland boundaries and to map this type. Snowbed wetlands, which only occur on north-facing slopes in the extreme upper elevations of Pete's and East Pete's bowls, are the least similar in both appearance and function to the other wetland types in the PA. In particular, the source of water to these wetlands (slow melting snow patches) creates a mosaic of moist to truly hydric soil conditions, with the resulting variation in plant communities. Most of the snowbed complexes are forested wetlands, with an overstory of Engelmann spruce and subalpine fir. The understory of snowbeds are dominated by mosses, prostrate sibbaldia, marsh marigold, Drummond rush, and tufted hairgrass.

3.3.4

WILDLIFE

The PA includes about 4,300 acres of high elevation (9,000 to 11,600 ft) terrain located within the limits of a SUP boundary on the WRNF (Figure 1.5). The PA is located on the southern edge of the developed ski area and consists of a diversity of habitats including subalpine forest, mountain meadows, riparian zones, and aquatic areas. These habitats are occupied by a variety of wildlife species on either a seasonal or year-round basis.

The descriptions of wildlife and wildlife habitats contained in this section incorporate an appreciable body of scientific and technical work conducted by state and federal agencies, Colorado State University, private consultants, and other sources. This included various wildlife studies and surveys on elk migration, small mammals, songbirds, and threatened and endangered and Forest Sensitive species. Some of these previous studies are cited in this EIS and have been reviewed by the Forest Service for inclusion in this document.

Wildlife surveys and studies were conducted during June through September 1994 by biologists from the third-party contractor and the Forest Service (Pioneer 1995b). Potential impact areas and all habitat types were surveyed for wildlife and their sign, i.e., tracks, nests, scat, burrows, and songs. The edges of ponds and wetlands were systematically searched for amphibians or their sign. Observations were recorded by location and habitat type.

Descriptions of wildlife and their habitats are discussed in three sections: General Wildlife; Species of High Public Interest; and Threatened, Endangered, and Candidate Species. General wildlife includes nongame species, WRNF Management Indicator Species (except game species), and Forest Sensitive species (as listed by Region Two). Species of high public interest include those species that the public actively pursues for recreation and are of high economic importance such as deer, elk, and grouse. Threatened, endangered, and candidate species are defined under the ESA.

3.3.4.1 General Wildlife

The WRNF is located in the North-Central Highlands and Rocky Mountain Ecological Subregion (USDA-FS 1994e). This ecological subregion is characterized by a variety of topographic and climatic conditions providing habitat for numerous species of wildlife. The WRNF is known to provide habitat for 72 species of mammals, 202 species of birds, 11 species of reptiles, 5 species of amphibians, and 17 species of fish (USDA-FS 1984). Typical large mammal species include elk (*Cervus elaphus nelsoni*), mule deer (*Odocoileus hemionus*), Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*), black bear (*Ursus americanus*), and mountain lion (*Felis concolor*). Common small mammals are yellow-bellied marmot (*Marmota flaviventris*), American beaver (*Castor canadensis*), snowshoe hare (*Lepus americanus*), American pika (*Ochotona princeps*), northern pocket gophers (*Thomomys talpoides*), and marten (*Martes americana*). Clark's nutcracker (*Nucifraga columbiana*), gray jay (*Perisoreus canadensis*), northern flicker (*Colaptes auratus*), steller's jay (*Cyanocitta stelleri*), and mountain bluebird (*Sialia currucoides*) are familiar bird species in the WRNF. In alpine areas, white-tailed ptarmigan (*Lagopus leucurus*) are common. Reptiles and amphibians of the area include striped chorus frogs (*Pseudacris triseriata*), northern leopard frogs (*Rana pipiens*), and western terrestrial garter snakes (*Thamnophis elegans*).

Wildlife within the PA is generally representative of the WRNF. Forested habitat types within the PA are dominated by spruce-fir, lodgepole pine, or mixed coniferous forest cover types. Wildlife species most commonly found in these types included mountain chickadee (*Parus gambeli*), dark-eyed junco (*Junco hyemalis*), ruby-crowned kinglet (*Regulus calendula*), American robin (*Turdus migratorius*), hermit thrush (*Catharus guttatus*), yellow-rumped warbler (*Dendroica coronata*), pine siskin (*Carduelis pinus*), red squirrel (*Tamiasciurus hudsonicus*), porcupine (*Erethizon dorsatum*), snowshoe hare, southern red-backed vole (*Clethrionomys gapperi*), and elk. Pure aspen stands are frequented by American robin, house wren (*Troglodytes aedon*), mountain bluebird, dark-eyed junco, warbling vireo (*Vireo gilvus*), Townsend's solitaire (*Myadestes townsendi*), least chipmunk (*Eutamias minimus*), and elk.

In meadow/grassland habitat types, commonly observed species include white-crowned sparrow (*Zonotrichia leucophrys*), horned lark (*Eremophila alpestris*), mountain bluebird, American robin, American pipit (*Anthus rubescens*), northern pocket gopher, montane vole (*Microtus montanus*), western jumping mouse (*Zapus princeps*), deer mouse (*Peromyscus maniculatus*), elk, mule deer, and yellow-bellied marmot. Scree/talus slope habitats have high numbers of yellow-bellied marmot, least chipmunk, American pika, and white-crowned sparrow. Wetland habitat types support the greatest diversity of species observed. In particular, these habitats are characterized by a variety of birds including swallows (*Tachycineta* spp., *Hirundo* spp.), warblers (e.g. yellow warbler (*Dendroica petechia*), Wilson's warbler (*Wilsonia pusilla*), broad-tailed hummingbird (*Selasphorus platycercus*), and song sparrow (*Melospiza melodia*). Also commonly present are elk, mule deer, a variety of amphibians, invertebrates, and signs of black bear and American beaver.

3.3.4.1.1 Lime Creek Road

This optional timber road would run through about 5,430 feet of recruitment old-growth spruce-fir forest and 600 feet would traverse a meadow (Timber Resources section of Chapter 4). Of this distance, about 875 and 4,555 feet would be within the PA and LA, respectively. It could be built under either Alternative A or C. Wildlife species that occur, or potentially occur, in these areas are similar to those described above. In particular, these areas provide suitable habitat for lynx, marten, southern red-backed voles, boreal owls, and three-toed woodpeckers.

3.3.4.1.2 Management Indicator Species

The WRNF has identified Management Indicator Species (MIS) to help monitor specific habitat types and the group of species associated with each habitat type (USDA-FS 1994f). Elk, mule deer, and bear are MIS but are discussed later in the section entitled Species of High Public Interest. Other MIS identified by the WRNF and pertinent to the PA are the pika, southern red-backed vole, snowshoe hare, Wilson's warbler (*Wilsonia pusilla*), American pipit, white-crowned sparrow, blue grouse (*Dendragapus obscurus*) and the mountain chickadee. The general habitat requirements for MIS are described below. The extent of suitable habitat for MIS is indicated below based primarily on vegetation types.

Pika Although there is no official WRNF MIS for scree/talus, for the purposes of this EIS pika were utilized as such. Pika typically inhabit scree/talus habitat at elevations ranging from 8,000 to 13,500 feet (Whitaker 1980). They are restricted to alpine and subalpine talus slopes adjacent to grassland habitats (Fitzgerald et al. 1994). There are approximately 26 acres of suitable pika habitat within the PA. This habitat occurs in three upper elevation patches in Pete's Bowl. In addition to the habitat in the PA, there are approximately 351 acres within the LA. However, due to the patchy distribution of these habitats and a tendency to stay near their site of birth (Smith and Ivins 1983; 1984), individual populations of pika remain relatively isolated from one another (Tolliver et al. 1985; Fitzgerald et al. 1994). Throughout the summers of 1993 and 1994, pika were observed in Pete's Bowl (Pioneer 1995b).

Vole Southern red-backed voles are usually associated with mesic coniferous montane and subalpine forests (Armstrong 1977). They are common in mature lodgepole pine and spruce-fir forests with good cone production and an abundance of surface litter including logs. These voles will use a variety of other habitats including open woodlands, grassy meadows, willow riparian areas and talus slopes. Red-backed voles were found in the mature lodgepole pine, spruce-fir, mixed forest stands, and in old-growth spruce-fir stands within the PA. These voles were the only small mammal observed in mature lodgepole pine stands during 1994 surveys (Pioneer 1995b). About 2,408 acres of lodgepole pine, spruce-fir, and mixed coniferous forest habitat exist for southern red-backed voles and about 5,691 acres occur within the LA.

Snowshoe Hare Snowshoe hare prefer early successional forests having dense understories and greater than 2,000 stems per acre at breast height (Keith and Surrendi 1971; Fox 1978; Koehler 1990; 1991). Part of the importance of snowshoe hare populations is their direct relationship to the quality of habitat for Canada lynx. In Colorado these forests are primarily spruce-fir, and mixed spruce-fir and lodgepole pine (Dolbeer and Clark 1975). During spring and summer hares forage on a wide variety of herbaceous vegetation (Brooks 1955; Dodds 1960; Wolff 1978). An analysis of the potential snowshoe hare habitat within the PA showed that 642 of the 1,351 acres of spruce-fir and lodgepole pine habitat have more than 2,000 stems per acre, the quantity of stems most preferred by hare (MAP 9).

Using the Habitat Evaluation Procedure (HEP) developed by the FWS (1976), a Habitat Suitability Index (HSI) was calculated for the PA using the Habitat Suitability Model (Carreker 1985) by Pioneer (1995b). The overall HSI for the snowshoe hare habitat within the PA ranged from 0.1 to 0.3 (scale of 0 to 1.0). An HSI of 1.0 equates to habitat of optimal quality whereas an HSI of less than 0.2 is indicative of low to poor quality habitat. The number of Habitat Units (HUs) is derived by multiplying the HSI by the number of acres of suitable habitat. Existing conditions for the PA using the above model showed a range of 560 to 1184 HUs for snowshoe hare. Thus, although suitable habitat for hare occurs within the PA, only about half of it may be capable of supporting high densities of hare. In the LA, 4,071 of the 8,137 acres of potential snowshoe hare habitat has more than 2,000 stems per acre. Snowshoe hare and their sign were observed in the PA within and near spruce-fir and other conifer forests.

Blue Grouse Blue grouse are common residents of foothills and mountains in Colorado, occurring in virtually all coniferous forests in these areas (Andrews and Richter 1992). Blue grouse breed in open coniferous and aspen forests with a shrub understory and winter in Douglas fir and lodgepole pine stands. Mean breeding bird densities of blue grouse during 1994 were estimated at 1.7 birds/100 acres in lodgepole pine forests and 2.5 birds/100 acres in aspen forests (Thompson 1994a). Using the Forest Service Region Two Habitat Capability Program (HABCAP), approximately 3,424 and 1,440 acres of summer and winter blue grouse habitat, respectively, were identified within the PA (Dobbs et al. 1987). Within the LA, about 27,827 acres of summer habitat and 11,197 acres of winter habitat exists.

Wilson's Warbler Wilson's warblers commonly nest in willow thickets along streams, ponds, and wet meadows in montane and subalpine areas (Hallock 1984). Limited habitat exists for this warbler in the PA; about 76 acres of willow thickets occur along Two Elk Creek and its tributaries. Although this bird was not observed during breeding bird surveys, it was noted by Pioneer biologists while conducting wetland inventories.

American Pipit The American pipit is a common summer resident above timberline (Andrews and Richter 1992). It breeds in moist or wet areas on alpine tundra (Braun 1980). During migration, these birds are common throughout Colorado, including in the PA and LA. American pipits were reported during breeding bird surveys in meadow habitats (Thompson 1994a; 1994b). Given that no alpine tundra exists on the PA, it is assumed that these were migrant birds on their way to breeding habitat.

White-crowned Sparrow White-crowned sparrows are common summer residents in Colorado above 9,000 feet (Andrews and Richter 1992). These sparrows breed in willow shrublands, brushy meadows, and krummholz. They are occasionally found in dense spruce-fir forests or in willow thickets above timberline (Braun 1980). In migration and winter the white-crowned sparrow can be found in most wooded and brushy habitats. Breeding habitat occurs in meadows and along willow-dominated riparian areas on the PA. Mean breeding densities of white-crowned sparrows were estimated at 12.7 and 2.4 birds/100 acres in 1993 and 1994, respectively (Thompson 1994a; 1994b). Approximately 983 acres of summer habitat and 44 acres of winter habitat for these sparrows were identified within the PA based on HABCAP modeling. The LA contains 10,247 and 1,402 acres of suitable summer and winter habitat, respectively.

Mountain Chickadee The mountain chickadee is one of the most common breeding species in old-growth spruce-fir forests (Scott et al. 1982; Hallock 1988). In fall and winter this species migrates down to lower elevations. Breeding habitat is available throughout the PA in the form of 1,029 acres of mature and old-growth spruce-fir stands. The LA contains about 5,294 acres of old-growth and mature spruce-fir that provide suitable chickadee nesting habitat. In 1993, mean breeding bird densities were estimated at 9.3 and 14.5 birds/100 acres in

lodgepole pine and spruce-fir habitats, respectively. Mean breeding bird densities in 1994 were approximately 9.3 and 12.0 birds/100 acres in lodgepole pine and spruce-fir habitats, respectively (Thompson 1994a; 1994b).

3.3.4.1.3 Forest Sensitive Species

Region Two of the Forest Service has designated those species declining in numbers or occurrence, or whose habitats are declining such that they may become federally listed if current trends continue, as "Forest Sensitive species." The list of WRNF sensitive species (USDA-FS 1994f) was used to determine which species should be assessed in the BE prepared for this project.

The following Region Two Forest Sensitive species may occur in the Vail area: marten, dwarf shrew (*Sorex nanus*), pygmy shrew (*Sorex hoyi*), Townsend's big-eared bat (*Plecotus townsendii*), boreal owl (*Aegolius funereus*), flammulated owl (*Otus flammeolus*), three-toed woodpecker (*Picoides tridactylus*), olive-sided flycatcher, golden-crowned kinglet (*Regulus Satrapa*), tiger salamander (*Ambystoma tigrinum*), and northern leopard frog.

Marten Marten primarily utilize mature spruce-fir habitats between 8,000 and 13,000 feet elevation (Towry 1984). These carnivores are generally associated with 30 percent or more canopy cover (Koehler and Homocker 1977; Allen 1987; Buskirk and Powell 1994). Coarse woody debris, especially in the form of large-diameter tree boles is an important habitat component for marten (Buskirk and Ruggiero 1994), providing thermal protection, access to subnivean spaces, and escape cover (Buskirk et al. 1989; Corn and Raphael 1992). About 1,028 acres of spruce-fir habitat for marten is available within the PA. About 5,691 acres of suitable marten habitat exists within the LA. Additional habitat may be available in the form of mature lodgepole pine forest. Marten were observed in the PA by biologists conducting past and recent surveys.

Dwarf Shrew Dwarf shrew are generally considered rare in Colorado (Armstrong 1972). This shrew inhabits talus slopes in a variety of community types, including alpine, coniferous forest, scrub oak, and mountain mahogany vegetation types (CDOW 1990). Recent records of the dwarf shrew have been reported in the Eagle Block of the Colorado Mammal Distribution Latilong Study (CDOW 1990). Potential suitable dwarf shrew habitat is limited within the PA to three patches of talus slopes comprising a total of 26 acres in Pete's Bowl. An additional 351 acres of scree/talus slopes within the LA provide suitable habitat for these shrews.

Pygmy Shrew Habitat for the pygmy shrew in Colorado is primarily comprised of spruce-fir forests (Towry 1984). The pygmy shrew apparently relies on downed logs and organic debris for cover (Towry 1984; Fitzgerald et al. 1994), and is found in all structural stages, but is most abundant in early to mid-successional stages of spruce-fir and lodgepole pine forests (Towry 1984). Within the PA these habitats are limited to mature and old-growth spruce-fir stands. There are about 1,028 and 5,691 acres of this habitat type present within the PA and LA, respectively. Additional habitat may be available in the form of mature lodgepole pine forest. It is not known whether this species exists within the PA.

Townsend's Big Eared Bat Townsend's big eared bat utilizes western shrubland, pinyon-juniper woodlands, and open montane forests to elevations of about 9,500 feet (Fitzgerald et al. 1994). It is typically associated with caves and abandoned mines and buildings for use as day roosts and winter residences. During summer, individuals may use cracks within cliffs as day roosts. Townsend's big-eared bats are relatively sedentary and do not move far between hibernacula and summer roosts sites, or far from their day roosts to forage (Barbour and Davis 1969 Kunz and Martin 1982). The availability of hibernacula appear to be a limiting resource for this species. Although suitable summer roosts occur within the PA, no suitable hibernacula are present or nearby

within the LA. Bat surveys were not conducted in the PA and thus, the presence of Townsend's big-eared bat was not confirmed.

Boreal Owl Boreal owls prefer high-elevation, dense stands of mature and old-growth spruce-fir (Palmer 1986; Hayward et al. 1987; USDA-FS 1991a). About 1,028 acres of spruce-fir habitat for boreal owls is available within the PA and there is about 5,691 acres of suitable habitat in the LA. Two boreal owls were located during 1993 surveys in relatively young, dense stands of lodgepole pine and spruce-fir (Thompson 1994a). These locations were on the edge of large natural openings between 9,280 and 11,400 feet in Pete's, East Pete's, and Commando bowls. Although none were observed in the mature spruce-fir stands in Commando or Super bowls, given that these areas represent suitable boreal owl habitat, it is likely that they occur there as well.

Flammulated Owl The flammulated owl occurs from 6,000 to 10,000 feet elevation in old-growth (>200 years) and mature (>150 years) ponderosa pine, in ponderosa/Douglas-fir forests (often mixed with mature aspen), and in pure aspen stands (Andrews and Righter 1992). The PA is at the upper elevation range of flammulated owl habitat. The only potential habitat within the PA occurs in aspen stands in Tea Cup Bowl, and southwest of the Lift 5 base terminal in lower Sun Down Bowl (Thompson 1994a). No flammulated owls were observed in this stand or anywhere in the PA nevertheless, there is potential mature/old-growth habitat in the form of 417 acres of aspen in the LA.

Olive-sided Flycatcher The olive-sided flycatcher is normally found in mature coniferous forests (Towry 1984). They are also associated with forest/meadow edge habitat where they hunt insects from perches on top of tall snags or trees with dead crowns. This flycatcher's affinity for unusually large trees may limit its abundance or distribution (Finch 1992). Despite the absence of mature lodgepole pine forest, suitable habitat for this species in the form of mature and old-growth spruce-fir stands is prevalent within and adjacent to the PA. The olive-sided flycatcher was only observed within spruce-fir habitat in the PA. There are about 1,028 acres of mature/old-growth spruce-fir within the PA and 5,294 acres within the LA. Mean breeding bird densities for the olive-sided flycatcher in the PA were estimated at 0.6 and 1.3 birds/100 acres during 1993 and 1994, respectively (Thompson 1994a; 1994b).

Three-toed Woodpecker Three-toed woodpeckers inhabit primarily mature and old-growth spruce-fir forests (Towry 1984) from 8,500 to 11,500 feet elevation. Where insect populations are high, however, it may also occur in ponderosa pine, Douglas-fir, and lodgepole pine forests (Andrews and Righter 1992). About 1,028 acres of suitable habitat for the woodpecker exists within the PA in the form of high-elevation mature spruce-fir forest patches. Additionally, about 5,294 acres of suitable habitat occurs within the LA. Mean breeding bird densities for the three-toed woodpecker in the PA were estimated at 1.9 and 0.6 birds/100 acres during 1993 and 1994, respectively (Thompson 1994a; 1994b).

Golden-crowned Kinglet The golden-crowned kinglet breeds in mature, dense spruce-fir forests, typically above 9,000 feet elevation (Andrews and Righter 1992). Additionally, kinglets utilize dense spruce-fir forests to meet foraging requirements (Andrews and Righter 1992). There is approximately 1,028 acres of this habitat type within the PA and 5,294 acres in the LA. Mean breeding bird densities for the golden-crowned kinglet were estimated at 0.6 and 1.9 birds/100 acres during 1993 and 1994, respectively (Thompson 1994a; 1994b).

Tiger Salamander The tiger salamander is a common amphibian which breeds in high elevation ponds, lakes, and streams in Colorado (Hammerson 1986). During the non-breeding season, this species may occupy any adjacent habitat type, including spruce-fir, lodgepole pine, ponderosa pine, Douglas-fir, aspen, mountain parks, and riparian habitats (Hammerson 1986). The tiger salamander has some protection: the taking and possession of

the gilled-form larvae (i.e., waterdogs) is limited to 20 animals less than 5 inches in length and, the possession of terrestrial adults (i.e., the land form) is limited to 6 animals (CDOW 1993:11). This salamander is present within the LA, including the existing ski area. Surveys conducted in portions of the appropriate habitat during the summers of 1993 and 1994 confirmed the presence of this species within the PA (Pioneer 1995b).

Northern Leopard Frog The northern leopard frog is found throughout most of Colorado. This species inhabits the banks and shallow portions of marshes, ponds, lakes, reservoirs, beaver ponds, streams, and other bodies of permanent water, especially those having rooted aquatic vegetation (Hammerson 1986). The northern leopard frog is known to occur in the Vail area and suitable habitat is located within and adjacent to the PA. No leopard frogs, however, have been observed within the PA.

3.3.4.2 Species of High Public Interest

High public interest species are those which the public actively seeks for recreation, or those which receive higher levels of public attention and are consequently of high economic value. Species of high public interest include Rocky Mountain elk, mule deer, black bear, and mountain lion. Blue grouse are also considered a species of high public interest but are discussed above as a MIS. From both an economic and hunter-interest standpoint, elk are the most important big game species in Colorado. The statewide elk population is estimated at over 200,000 with an annual harvest exceeding 50,000. With over 88,000 nonresident elk licenses sold in 1992 (Zent 1993), the economic benefit of elk hunting in Colorado is significant, especially to small towns and rural areas where purchases are made.

The PA is located in Game Management Unit (GMU) 45. Estimated post-hunt population size of the GMU 45 elk herd was 806 individuals (Byrne 1995). Elk that are seasonally present in the PA belong to the Dowd Junction-Two Elk Creek Herd (Thompson 1986a; de Vergie and Alldredge 1989). In fall, these elk utilize the PA transitionally en route from their Stafford Creek summer range (between Vail Pass and Copper Mountain) to their Dowd Junction winter range, east of U.S. Highway 24 near the confluence of the Eagle River and Gore Creek by the Town of Minturn (Figure 3.5). Initiation of fall migration depends on the timing of winter storms, but elk usually leave the PA by mid-November. Calving and rearing begins in mid-May and continues through June. Calving usually occurs at the lower elevations of south-facing slopes within the Two Elk Creek drainage. Within the PA (Figure 3.5), calving occurs primarily in Tea Cup Bowl, and the lower portions of Sun Up and Sun Down bowls (Andree, *pers. comm.*, 1995). Some calving also occurs immediately outside the PA in lower China and Siberia bowls. Elk primarily use aspen, lodgepole pine, grassland/meadow, and mountain brush habitats during the calving season. In order to support elk calving and rearing, VA, in concert with the CDOW, institutes a closure of a China Bowl area to construction and general human activities in calving areas from May 1 through June 30 each year (USDA-FS 1986b). Three provisions from the 1986 EA/DN influence the closure as well as management of summertime activities in the Back Bowls. They are: 1) Minimize construction and general human activity in the calving areas between 1 May and 30 June, 2) Protect identified calving areas to the extent possible, and 3) Prohibit organized summer activities in existing China Bowl and the CAT II and III areas. After calving, elk continue migrating east and south, up the Two Elk drainage to their summer range. Most elk leave the PA by late June (Morrison and Alldredge 1992; Alldredge 1993). However, a few elk use the PA throughout summer (Andree, *pers. comm.*, 1995).

Mule deer occupy all ecosystems in Colorado, but attain their greatest densities in shrublands on rough, broken terrain (Fitzgerald et al. 1994). Deer in the GMU 45 are mostly transient and not year-round residents (Byrne 1995). The post-hunt population estimate for deer in GMU 45 during 1994 was 640 individuals. Deer occur seasonally in the PA and belong to the Eagle River herd. Most deer in this herd winter north of I-70 probably

October 1995

Eagles Nest
Wilderness

Source of base map:
U.S.G.S. 7.5 min. Quad Overlays
Vall East, Vall West, Vall Pass,
Minturn, Red Cliff

Figure 3.5. Critical elk winter range and calving habitat.

in GMUs 36 and 35, and some in GMU 44. However, some deer are sympatric with elk on the Dowd Junction winter range (CDOW 1984; Thompson 1985). Deer fawn in and around the PA in June (Andree, *pers. comm.*, 1995), in wooded areas with dense brushy or herbaceous understories. Deer summer in and around the PA, primarily in aspen and lodgepole pine habitats with an abundance of shrubby/herbaceous understories (Thompson 1986a). However, development of the existing ski area in the CAT I and CAT II areas have probably decreased the value of these areas for deer due to the relatively large numbers of summer recreationists (Andree, *pers. comm.*, 1995).

The potential value of the PA for deer and elk can be evaluated by the cover-forage ratio (Thomas 1979). An optimum ratio of 40 percent of the area in cover condition and 60 percent in forage condition is generally considered to produce maximum use by deer and elk and is the standard for the WRNF Forest Plan (USDA-FS 1984). Currently the cover-forage ratio within the PA is 68 percent in cover and 32 percent in forage. This ratio exceeds the optimum and, thus, habitat manipulation that would reduce this ratio may increase the value of the PA for deer and elk (Thomas 1979). The cover-forage ratio for these species in the LA is about 83 percent in cover and 17 percent in forage.

Black bear in Colorado are most common in montane shrublands and forests, especially in areas with well developed stands of berry-producing shrubs (Beck 1991; Fitzgerald et al. 1994). Bear populations in the vicinity of the PA are considered to be healthy (Byrne 1995). Although precise black bear population estimates are not available, the entire PA is considered suitable habitat for black bear. Bears and their sign (i.e., feces, tracks, and claw marks) observed by Pioneer biologists and Thompson (1985) suggest the presence of several bear in the PA.

Mountain lions are found throughout the western portion of Colorado in all forested habitats, preferring the rough, rocky terrain of the lower mountains and transition zones where prey is more abundant. Mule deer are the preferred prey species, constituting 60 to 80 percent of the diet (Russell 1978). Mountain lions in GMU 45 are not common and there may not be a resident population (Byrne 1995). Much of the high-elevation, densely forested zones within the PA are not optimal mountain lion habitat, although mountain lions may occasionally use the area.

3.3.4.3 Threatened, Endangered, and Candidate Wildlife

3.3.4.3.1 Federally Listed Wildlife Species

Federal agencies, in consultation with the FWS, are required to ensure that any action they authorize, fund, or carry out will not adversely affect a federally listed threatened or endangered species. The ESA requires a BA if federal actions (decisions) associated with the authorization or funding of a project could potentially affect the continued existence of a federally listed species, or results in the destruction or adverse modification of its critical habitat. A BA was prepared for this project and is on file with appropriate government agencies.

The FWS provided a list of federally listed threatened and endangered species that may occur within the area of influence of the Proposed Action (Rose 1994; 1995). No endangered or threatened terrestrial species occur within the PA; however, one listed terrestrial species, the peregrine falcon (*Falco peregrinus*), is known to occur in the LA and RA and habitat for a recently listed species, the southwest willow flycatcher (*Empidonax traillii extimus*) occurs in the LA and RA.

The peregrine falcon is listed as an endangered species by the FWS and the state of Colorado. Peregrines occupy a wide variety of habitats for foraging, including coniferous forests in mountain terrain (Radcliffe 1980; Cade 1982). Although nest sites above 8,500 feet are rare, nesting occurs to above 9,000 feet elevation (USDI-FWS 1984). Peregrines will travel greater than 18 miles from a nest site to hunt; however, the average hunting area around a nest is 10 miles in diameter, with 80 percent of foraging occurring within one mile (Porter and White 1973; Cade et al. 1988). No nesting sites are known to occur in the PA, however, there is one known nesting site in the LA. This nest is about 1.5 miles outside of the CAT III area. During 1994 the nest site was occupied by an immature female but no eggs or young were produced. During 1995 the site was occupied by two adult males and an adult female. Again no young were produced at the site. The peregrine falcons that use this site appear to forage to the north of their nest, across the river, and out into the valley (Johnston, *pers. comm.*, 1995). HABCAP modeling identified about 2,936 and 18,109 acres of suitable feeding habitat within the PA and LA, respectively. During informal consultation (Rose 1994; 1995b), the FWS did not identify the PA as critical habitat for the peregrine falcon.

During preparation of this Draft EIS the status of the southwest willow flycatcher changed from a candidate species to endangered (USDI-FWS 1995). Suitable habitat for this flycatcher consists of thickets of trees and shrubs, primarily willows, often with a scattered overstory of cottonwoods (Unitt 1987; Andrew and Righter 1992). Thompson (1994a) conducted surveys for this flycatcher in the PA, but none were observed. These inventories, however, did not use National Biological Survey (NBS) required protocols developed specifically for the southwestern willow flycatcher. The Forest Service and FWS have agreed that the range of the southwestern willow flycatcher in Colorado is below 8,500 feet elevation and west of Rifle, CO (USDA-FS 1995b). Based on this determination, the FWS stated that there was no need to consider this species in the Draft EIS, unless project effects west of Rifle were anticipated. Consequently, no further surveys were conducted. However, recognition of willow/riparian habitat that would potentially be suitable for this species was identified (see Vegetation section above) in order to facilitate inventories of potential breeding habitat and to accommodate any future changes in protocol.

3.3.4.3.2 Candidate Wildlife Species

Candidate species for federal listing do not have any legal protection under the ESA (1973, as amended). However, it is in keeping with the spirit of the ESA to consider potential effects to these species before authorizing a project or action that could potentially affect them. As part of the NEPA decision-making process, the Region Two Forest Service policy (FSM 2672.1) requires a Biological Evaluation be prepared to address these candidate species to determine if the Proposed Action would lead to federal listing or loss of species viability. The FWS provided a list of federal candidate species being considered for listing under the ESA that may occur within the area of influence of the PA. These species include the North American lynx (*Felis lynx canadensis*), boreal toad (*Bufo boreas boreas*), northern goshawk (*Accipiter gentilis*), and wolverine (*Gulo gulo*). All of these species except the goshawk are listed as endangered by the state of Colorado.

Boreal toads are rare to locally uncommon amphibians restricted to suitable wetland breeding habitat in lodgepole pine, spruce-fir, and alpine meadows in Colorado (Nesler and Goettl 1994). Breeding habitat consists of lakes, marshes, ponds, and bogs from 7,000 to 12,900 feet elevation. During the non-breeding season, adult toads may occupy any adjacent habitat types, including spruce-fir, lodgepole pine, ponderosa pine, Douglas-fir, aspen, mountain parks, and riparian habitats, moving up to several miles from the breeding site (Hammerson 1986). However, the distribution and movement of young toads are restricted by available aquatic habitat. Breeding habitat for boreal toads within the PA is limited to 0.8 acres consisting of Commando Pond and two ponds in lower Sun Down Bowl. The available breeding habitat was systematically surveyed for adult,

metamorphosed young, and toad larvae in September 1992, June and July 1993, and June 1994 (Thompson 1994a); ponds in lower Sun Down Bowl were systematically surveyed in July 1995 (Pioneer 1995b). Additional, non-systematic surveys for toads were made throughout spring and summer 1993-94. During 1993 surveys, two males were observed within the PA; no toads were observed during the 1994 or 1995 surveys.

The northern goshawk has historically been observed in the vicinity of the proposed project. Goshawks may inhabit mature stands of aspen, lodgepole pine, spruce-fir, or mixed forests at elevations of 7,500 feet or greater. An intensive northern goshawk survey was conducted in all pure aspen and mixed spruce-fir-aspen stands using amplified, conspecific (of the same species) calls according to recommended Forest Service protocols (Kennedy and Stahlecker 1991). During July 4-7 and on July 10, 1993, 199 calling stations were established, from which taped wailing calls were broadcast (Thompson 1994a). The survey was conducted during the nesting season, to determine species presence and locations of active nest sites. No goshawks responded to the wailing calls. However, three goshawks were observed in the PA incidental to other surveys in 1993 and 1994. About 292 acres of suitable goshawk nesting habitat exists within the PA in the Super Bowl West drainage. An inactive nest was located in this area in 1989 and it has not been occupied since that time (Thompson and Halfpenny 1989; Thompson 1994a). Within the LA, 1,214 acres of suitable nesting habitat exists for goshawk in four areas (Pioneer 1995b). One of these areas occurs on the developed ski area that receives relatively high levels of summer recreation. Although suitable from a habitat perspective, goshawks probably do not use this area because of the level of human disturbance. Figure 3.6 depicts goshawk nesting locations in the PA and LA.

Colorado marks the historical and current southernmost limit of the North American lynx (Halfpenny and Miller 1981; McCord and Cardoza 1982). It is generally agreed that lynx were never very abundant in the state and are currently very rare (Lechleitner 1969; Halfpenny and Miller 1981). Lynx populations and suitable habitat in Colorado are documented by the statewide Lynx Verification Program, and by several recent surveys (Andrews 1992; Carney 1993). A large percentage of Colorado lynx sightings have occurred in the Vail area, including in Commando and Super bowls (Thompson and Halfpenny 1989; Andrew 1992). Recent track sightings in the LA were reported from Mushroom Bowl and southwest of Super Bowl (Thompson and Halfpenny 1989; Andrews 1992). Within the RA there have been track sightings by Homestake/Gold Park and the upper Eagle River (Jackle Hut 1994; Byrne 1995). This suggests that due to the effects of I-70 topographically, lynx habitat as a unit may include lands between the southern portion of the Gore Range, Tennessee Pass, Holy Cross/Sawatch Range, and Vail.

Lynx habitat in Colorado consists primarily of two habitat types, early successional and mature/old-growth coniferous forest. Early successional stands are used principally for foraging. The distribution and abundance of lynx is intimately associated with that of snowshoe hare, its primary food source (Koehler 1990; Ward and Krebs 1985; Koehler and Aubry 1994). In Colorado, dense spruce-fir stands with an abundance of seedling and sapling trees support the highest densities of snowshoe hares (Dobleer and Clark 1975; Andrews 1992). In Utah, Wolfe et al. (1982) found that hares seldom use stands with understories having less than 40 percent horizontal cover density at 3 to 8 feet above the ground. Studies in Washington, Alaska, Nova Scotia, and Maine found that hares used stands that had stem densities ranging from 2,400 to 8,900 stems/acre (Wolff 1980; Litvaitis et al. 1985; Monthey 1986; Koehler 1990). In the PA, forest stands capable of supporting snowshoe hare consist of 1,351 acres in Commando, Pete's, and Super bowls (MAP 9). However, only 642 acres of this area represent optimal snowshoe hare habitat and thus, optimal lynx foraging habitat. Within the LA, there are 8,137 acres of potential lynx foraging habitat in the form of spruce-fir and lodgepole pine stands capable of supporting snowshoe hares. However, only 4,071 acres of this represents preferred winter habitat for snowshoe hare.

Vail Ski Area
Category III Development
Environmental Impact Statement

October 1995

Eagles Nest
Wilderness

WHITE RIVER
NATIONAL
FOREST

Eagles Nest
Wilderness

WHITE RIVER
NATIONAL
FOREST

Holy Cross
Wilderness

WHITE RIVER
NATIONAL
FOREST

Landscape Area
Vegetation Cover Types:

GM	grass	AS	aspen
WM	meadow	LP	lodgepole
SC	rock	SF	spruce/fir
MB	shrub	DF	Douglas fir
U	urban	OW	open water

Potential Goshawk
Nesting Habitat
-Nesting Habitat

0 1 mile

Source of base map:
U.S.G.S. 7.5 min. Quad Overlays
Vail East, Vail West, Vail Pass,
Mintum, Red Cliff
UTM grid, zone 13

Figure 3.6. Location of potential nesting habitat for the northern goshawk in the PA and LA.

Suitable denning habitat for lynx, which consists of dense mature forest containing large woody debris (Koehler 1990; Koehler and Brittell 1990), also occurs within the PA and LA (MAPs 6 and 7). Within the PA, potential denning habitat occurs primarily in Commando and East Pete's bowls, but Pete's and Super bowls also provide suitable foraging areas. Immediately surrounding the PA, the Lime Creek and Turkey Creek drainages could provide denning habitat for lynx. Potential denning habitat also occurs to a lesser degree in Mushroom and Benchmark bowls in the CAT II area. Given the historical use of the area by lynx (Halfpenny and Miller 1981), the recent discoveries of tracks (Thompson and Halfpenny 1989; Andrews 1992), and the presence of potentially suitable denning and foraging habitat, it appears possible that at least one lynx utilized portions of the PA during the winter of 1991-92.

Wolverines are restricted to boreal forests, tundra, and western mountains. It is generally agreed that wolverine habitat is best defined as areas containing adequate year-round food supplies in large, sparsely inhabited wilderness (Kelsall 1981). The project area is situated within historic wolverine range. CDOW surveys for wolverine have proven inconclusive and unable to verify the existence of viable populations. Only one reliable, visual observation of a wolverine, not released by a human, has occurred in Colorado the last 20 to 30 years. This observation was of a wolverine killed in northwestern Colorado along the Utah state line in the vicinity of Dinosaur National Monument. It is unlikely that a wolverine population exists in the vicinity of the PA. However, the PA represents potential habitat for this species. If a wolverine does exist in the RA, it could use the PA in summer and move into the Eagles Nest Wilderness in winter, utilizing the I-70 wildlife underpasses (Andree, *pers. comm.*, 1995).

3.3.5 BIODIVERSITY

Noss and Cooperrider (1994:5) provide a general working definition of biodiversity:

"Biodiversity is the variety of life and its processes. It includes the variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning, yet ever changing and adapting."

Apparent in this definition is the fact that biodiversity is defined and measured on several scales including genetic, species/population, community/ecosystem, and landscape or regional (Noss and Cooperrider 1994).

The maintenance of genetic diversity is critical for ensuring that a given species will be able to withstand natural and/or human-caused disturbances to its habitat. With reference to rare species or those requiring large areas of relatively undisturbed habitat, the maintenance of enough quality habitat to ensure viable population sizes is essential for minimizing random losses of genetic diversity that restrict their ability to adapt to a dynamic environment (Noss and Cooperrider 1994).

At the species/population level, the number of different species occupying a given community or habitat type defines biodiversity. Whittaker (1972) termed this within-habitat diversity "alpha" diversity. This level of diversity is probably what most people think of when they hear the term "biodiversity" (Noss and Cooperrider 1994). It is important to note that when discussing the preservation or maintenance of biodiversity at this and higher levels, the aim is to preserve native diversity (i.e., species and communities indigenous to a given area). Thus, while the invasion of exotic plant or animal species may cause an increase in alpha diversity, it contributes nothing positive to the original community composition.

Between-habitat or "beta" diversity (Whittaker 1972) refers to the change in species composition occurring along an environmental gradient. Along this gradient, different species are found which are adapted to different conditions. The environmental gradient, then, determines the beta diversity of an area. Around Vail, the gradient consists basically of alpine, spruce-fir, lodgepole pine, grassland/meadow, aspen, and mountain shrub communities roughly occurring from high to low elevation. These communities would likewise be distributed along other gradients such as soil type and soil moisture regime. The variety of different interacting environmental gradients, the degree of natural and human-caused disturbance, the biological requirements of individual species, and the vagaries of seed dispersal and animal movements are a few of the important factors that determine the beta diversity of a given area.

Landscape-level or regional diversity, Whittaker's (1972) "gamma" diversity, refers to biodiversity at much larger scales. Landscape or regional diversity refers to pattern diversity or "the pattern of habitats and species assemblages across a land area of thousands to millions of acres" (Noss and Cooperrider 1994:11). Landscape or regional diversity has important functional ramifications. For instance, many animals require a variety of habitat types to meet their life history needs. Managing only one of these habitats in isolation would be inadequate for the protection of such species (Noss and Cooperrider 1994).

Each of the above definitions of biodiversity focuses on composition such as the genetic constitution of populations, the identity and relative abundances of species in a natural community, and the kinds of habitats and communities distributed across the landscape (Noss and Cooperrider 1994). There are also structural and functional components to biodiversity. Structural aspects of biodiversity refer to the juxtaposition of species, habitats, and natural communities. Functional aspects of biodiversity include the climatic, geological, hydrological, ecological, and evolutionary processes that generate and maintain biodiversity in continuously changing patterns (Noss and Cooperrider 1994).

Existing levels of biodiversity were assessed at the PA, LA, and RA scales. Specific parameters evaluated included old-growth and recruitment stands, habitat patchiness and fragmentation, interior and edge habitats, habitat structure and block size, linkages and corridors, vegetation type conversions, and species richness.

3.3.5.1 Landscape and Regional Areas

The Vail Ski Area is located in the North-Central Highlands and Rocky Mountain Ecological Subregion (USDA-FS 1994e). This ecological subregion is characterized by steeply sloping to precipitous flat-topped mountains dissected by narrow stream valleys with steep gradients. There are also gently rolling mountain parks, mountain ridges, and foothills. The WRNF is located in the southern Rocky Mountain division of this subregion and is characterized by a mosaic of vegetation types. About 64 percent of the WRNF is forested and 36 percent is in non-forested vegetation types (i.e., grassland/meadow, alpine, riparian, mountain brush, rocks/scree, water). Forested vegetation types are Englemann spruce-subalpine fir, lodgepole pine, aspen, Douglas fir, ponderosa pine, and pinyon-juniper. Each of these non-forested and forested habitat types supports a diverse array of plant and animal life. For example, there are 307 vertebrate species of animals in the WRNF, and numerous more invertebrate animals and plants (USDA-FS 1984).

A variety of ecological communities exists within the regional and landscape areas. This assemblage and its attendant patchiness is due to variations in elevation, slope, aspect, topography, moisture regime, and the frequency and intensity of natural disturbances (i.e., fire, avalanche) that have occurred in the region. Additionally, human alterations between 1860- 1900 such as fire ignitions, logging, and grazing have produced habitat fragmentation that have increased the community patchiness. Whittaker (1956) showed that in

mountainous regions, the pattern of communities often corresponds predictably to elevation and topographic-moisture gradients. Peet (1988) described a similar gradient mosaic for the central Rocky Mountains, which shows spatial relationships of vegetation to environment and how different communities fit into a larger landscape pattern. This diversity of species and community types and the spatial relationship among them within the LA and RA, is equivalent to the gamma diversity of the areas.

Gamma diversity in the LA and RA is comprised of the same habitat types and associated species that are found within the PA as well as other types such as ponderosa pine and riverine habitats. Urbanization, private land use, construction and maintenance of highways and roads, timber harvest, and recreation have all contributed to the relatively high degree of natural patchiness and fragmentation in the LA and RA (MAP 7). These larger analysis areas also encompass, at least in part, wildernesses such as the Holy Cross and Eagles Nest wildernesses. Within the LA and RA exist migration corridors for big game and other species (Thompson 1986a; 1986b; DeVergie and Alldredge 1989). These corridors or linkages not only provide for a means of transferring genetic material among populations at the landscape and regional scale, they also provide transitional habitat for movement of genes, populations, and communities in response to more global disturbances such as climatic change.

3.3.5.1.1 Lime Creek Road

Under one of the alternatives, an optional timber road would be built. It would extend through about 5,430 feet of recruitment old-growth spruce-fir forest and 600 feet would traverse a meadow (Timber Resources, Chapter 4). Of this distance, about 875 and 4,555 feet would be within the PA and LA, respectively. The optional road would traverse a recruitment spruce-fir stand that is one of the largest within the LA and straddles Battle Mountain Ridge in Commando Saddle. This area provides suitable habitat for forest-interior and snag-dependent species and is a potential corridor for wildlife moving between old-growth/recruitment stands in Lime Creek and Turkey Creek, and those in Timber Creek. There are many potential wildlife corridors in the RA. The Battle Mountain Ridge currently serves as a potential corridor between the Holy Cross and Eagles Nest wildernesses, provided animals can negotiate the existing barriers (i.e., Highway 24, I-70, rivers etc.).

3.3.5.2 Project Area (PA)

The existing PA is characterized by a relatively diverse assemblage of naturally occurring habitats (MAP 5). The same factors that gave rise to the community patchiness and fragmentation at the regional and landscape scales have also been important in shaping biodiversity at the PA scale. Because of this patchiness, a diversity of plant, animal, and habitat types has evolved and resulted in a relatively high level of alpha and beta diversity.

Estimates of alpha diversity are determined by species richness (i.e., the number of species in a given area) and abundance (i.e., the number of individuals or breeding pairs of a given species). Thompson (1994a; 1994b) estimated the richness and abundance of breeding birds in the PA as well as on the developed sites at the Vail Ski Area. These studies indicated that alpha diversity (the richness and abundance of species within habitat types) for breeding birds does not differ between the PA and the existing ski area for spruce-fir, aspen, or grassland habitats. However, bird abundance was lower in lodgepole pine habitats that have been fragmented by ski runs. Thompson also compared species richness and abundance in the PA to similar, undeveloped areas at Monarch, Breckenridge, and Quail Mountain ski areas, thus allowing for the comparison of alpha diversity between these areas. The PA had similar or higher richness and abundance values for spruce-fir and lodgepole pine habitats than the other ski areas. However, the PA had the lowest diversity indices (species richness and abundance) for aspen habitats, presumably due to the relatively unproductive structural characteristics of these stands. Also, the

PA had equal or greater estimates of alpha diversity compared to similar areas in Colorado, except in aspen habitats.

Thompson (1994a; 1994b) found no statistical differences in avian species richness or abundance between spruce-fir, lodgepole, and aspen habitats. Grassland/meadow habitats, however, had lower richness than the other habitat types. This suggests that a relatively low level of diversity between habitat types (when based on breeding birds) exists within the PA. However, beta diversity, the difference in species occurrence between habitats, is often masked by estimates of species richness.

The existing level of habitat patchiness and fragmentation existing in the PA was estimated using habitat block size analysis. Measurements of the number and sizes of blocks by habitat type were made from the vegetation type map (MAP 5). Block sizes ranged from less than 5 acres to about 500 acres. Old-growth spruce-fir stands had the fewest number of blocks (2) but had the largest average block size. Mountain brush habitat was represented by only 3 blocks and it had the smallest average block size. This baseline data on habitat block size were used to evaluate the effects of each alternative on the habitat patchiness within the PA in Chapter 4.

The PA contains several unique and sensitive habitat types including old-growth spruce-fir stands. The time it takes for these habitats to mature, and their importance to certain wildlife species makes them sensitive. Old-growth spruce-fir stands occur primarily in Commando, East Pete's, and Super bowls. These stands are essentially connected via a strip of old-growth that runs along the ridge (Battle Mountain) above the PA. Old-growth forests contain a relatively high degree of structural diversity that is usually not present in other successional stage stands. As a result of this structural diversity, old-growth stands may provide habitat for numerous organisms that are only associated with this seral stage. Snags are an important component of mature and old-growth stands, providing habitat for cavity nesting birds (e.g., three-toed woodpecker) and mammals (e.g., marten) that use holes, loose bark, or other features associated with standing dead trees. Downed logs also contribute to the diversity in these stands by providing habitat for invertebrates, nonvascular plants, algae, and bacteria. Logs also are an important habitat component for small vertebrates, some of which are prey for larger vertebrates. For example, logs are an important habitat component for southern red-backed voles, other voles (*Microtus* spp.), and a variety of shrews (*Sorex* spp.). These species, respectively, comprised 54.2, 25, and 5.5 percent of prey items for boreal owls in Colorado (Hayward 1994).

Old-growth habitat may be even more important for invertebrates. Schowalter (1990) reported that old-growth Douglas fir and western hemlock stands contained five times as many species and twice the number of functional groups of canopy arthropods (i.e. spiders, insects) as did younger-aged Douglas fir stands. The long-term stability of old-growth apparently favors increased arthropod diversity, including species with poor dispersal capacities (Moldenke and Lattin 1990). Moldenke and Lattin (1990) also reported that clearcutting and slash burning sites in the Northwest reduces total arthropods in the soil by about 90 percent. Spiders also decline with clearcutting, and recovery of typical species composition takes at least 30 years on mesic sites and much longer on xeric sites (McIver et al. 1990).

Another unique habitat type within the PA occurs in Commando pond (and other SAS), which is a remnant glacial pond located at the base of Commando Bowl, near Two Elk Creek. This pond provides critical breeding habitat for tiger salamanders and the boreal toad. Other important wetlands (and SAS) in the PA include Two Elk Creek, which provides suitable habitat for the Colorado River cutthroat trout, a network of forested wetlands in Commando Bowl, and beaver ponds in lower Sun Down Bowl.

3.4 HUMAN ENVIRONMENT

3.4.1 CULTURAL RESOURCES

3.4.1.1 Prehistory

Prehistorically, the PA was probably used by Indians for hunting and gathering, although no evidence of prehistoric activity was found during the archaeological survey.

3.4.1.2 History

Historical use of this area was also minimal, although miners, sheep herders, and early explorers probably passed through the area, no evidence was found of any substantial use or habitation within the PA (Shields 1993). Folklore states that in either 1859 or 1868 a large battle took place between Arapaho invaders and the area's resident Utes. This battle supposedly took place at either the confluence of Two Elk Creek and the Eagle River or on Battle Mountain (hence its name). No archaeological evidence was found to support the legend (Shields 1993).

3.4.1.3 Cultural Resource Surveys

The PA was surveyed for cultural resources in 1985, 1989, and in 1992 by archaeologists from Metcalf Archaeological Consulting, Inc. During the first survey, eight isolated artifacts and three sites were recorded within the PA (Metcalf & Black 1985). The second survey relocated two of the sites and recorded a new site and three more isolates (Shields 1993).

The optional Lime Creek timber haul route was surveyed by a Forest Service archaeologist in October 1994. No cultural remains were noted along the proposed route of the Lime Creek connector, but some shovel testing on the edges of meadows adjacent to the final layout of the road was recommended (Hardy 1994).

Site 5EA710 is a low density artifact scatter which contained a multifunctional flake tool probably used for scraping and cutting. The State Historic Preservation Officer (SHPO) agreed this site was not eligible for listing in the National Register of Historic Places (NRHP) and no further information could be gathered from the site.

The SHPO recommended that further analysis of site 5EA703 (a low density lithic scatter) was necessary before its eligibility could be determined, but since the site would not be impacted by any proposed development, no further excavation will occur at this time.

The newly recorded site is the Two Elk Trail, which reportedly dates to 1927. The trail continues to receive use to this day, and does not embody any significant features; it is not eligible for the NRHP.

The isolated artifacts (so called because they do not appear to be connected to a larger archaeological site) were stone tool fragments, pottery shards, a stove and a glass bottle. The pottery shards are characteristic of the Ute groups that occupied the area, and date from the 1700s to 1800s. The stove was constructed sometime between

1900 and 1945; the amethyst glass bottle dates from 1880 to 1917. None of these artifacts are eligible for listing on the NRHP and their locations do not need to be protected.

3.4.1.4 Ute Indian Consultation

Representatives from the Ute Indian Tribe visited the PA in the fall of 1994, to assist with identifying historically significant sites. They did not identify any areas within the PA as having cultural significance. In a letter (Chapoose 1995) to VA, the Ute Indian Tribe recommended proceeding with the proposed ski expansion project, but requested to be kept informed.

3.4.2 LAND USE AND PLANS

The area in the greater vicinity of the proposed project is a mix of public and private land supporting multiple uses of a residential, commercial, and recreational nature. Table 3.11 shows land ownership in Eagle County.

Over the past several decades, land use in the Vail area has responded to changing times and conditions. Given the high elevation, steep slopes and narrow valleys, mountain climate, and short growing season; the area has always had limited utility for agriculture other than summer grazing by livestock. This is increasingly true as much of the land suitable for agriculture or ranching has gradually been converted to housing and other development. Mining operations have also been prevalent in the recent past, the most important being at Gilman.

Table 3.11. Summary of land ownership in Eagle County, Colorado		
<i>Type/Owner</i>	<i>Square Miles</i>	<i>Percent of Total</i>
Public Land (Forest Service)	1,924	72.3
Public Lands (BLM)	384	14.5
State of Colorado	19	0.7
Private Lands	333	12.5
Total	2,660	100.0

Responding to the trend toward a service and recreation-based economy, current land use patterns reflect scattered growing communities around ski areas and other recreational facilities. As noted above there are two general classifications of land near the PA—land administered by government agencies and private land. The following sections discuss land use and plans within those two groups.

3.4.2.1 National Forest System (NFS) Lands

The PA and land in its immediate vicinity are part of National Forest System (NFS) land administered by the WRNF. Consistent with agency policy, the WRNF manages lands under its jurisdiction for a variety of recreational and commercial uses through the Forest Plan (1984) and various laws and regulations. The use of NFS lands by commercial entities is managed through the issuance of permits and contracts. The WRNF has issued permits for recreation (including ski areas), livestock grazing, utilities and communications,

transportation, and other special uses. It also enters into contracts for logging activities. While the Forest Service is the only manager of the public lands under discussion in this EIS, other agencies and offices have a particular jurisdictional interest in this proposal.

3.4.2.1.1 Ski Area Special Use Permits (SUPs)

As noted in Chapter 1, land management activities on the WRNF are guided by the Forest Plan (USDA-FS 1984, as amended). The Forest Plan allocated the CAT III area to management emphasizing downhill skiing. Specific management direction and standards and guidelines for management activities are defined in the Forest Plan.

Laws and regulations (36 CFR 251) allow the Forest Service to issue SUPs to authorize the occupancy and use of NFS lands for defined periods of time in order to help achieve Forest Plan objectives. The Vail Ski Area operates under the terms of a 40-year SUP issued by the WRNF to VA in 1992. The SUP for the Vail Ski Area is 12,590 acres in size and encompasses all of the CAT III area, in addition to all of the developed portions of the ski area. Annual operating plans, construction plans, and an accepted MDP are required by the SUP.

3.4.2.1.2 Grazing

The Two Elk Sheep and Goat Allotment includes much of the CAT III area. Under provisions of this permit, Piney Valley Ranch grazes a band of sheep each year in the area, beginning in mid-July and extending until about mid-September. The permitted area is about 22,000 acres in size, of which about 5,000 acres is considered suitable range land.

Historically, both sheep and cattle grazed this area. Together, the Two Elk and the nearby Game Creek Allotment provided forage for up to 2,000 sheep and 200 cattle throughout the 1920s and 1930s. Gradual reductions in grazing have occurred over the years and now only about 800 sheep graze the area each summer.

3.4.2.1.3 Minerals Development

Records show no historical evidence of mining in the PA, despite extensive activities on lands in close proximity, mainly the Gilman district 6 miles to the south. On March 5, 1993 the Forest Service formally applied to the Bureau of Land Management (BLM), the agency responsible for the management of all subsurface minerals, for a 20-year withdrawal of the 4,300 acres comprising the CAT III area. Upon receipt of this request, the BLM: (1) published a notice in the *Federal Register* on March 23, 1993 requesting public comment on the Proposed Action, and (2) segregated the land from all mining activities for two years until after the analyses could be completed. In support of its request, the Forest Service prepared an Environmental Assessment and accompanying mineral withdrawal report, which was completed in November of 1994. In March 1995, the BLM issued its decision to withdraw the CAT III area from mining activities for the protection of recreational resources, removing the CAT III area from location and entry activities until July 5, 2010.

3.4.2.1.4 Wilderness

Wilderness is an important resource on the WRNF. Approximately 33 percent (751,956 acres) of WRNF is Congressionally designated Wilderness. Within Eagle County, Wilderness is also an important feature. Of the approximately 1,232,000 acres (1,924 square miles) of NFS lands within Eagle County, about 12 percent are designated Wilderness. The Holy Cross Ranger District is 341,991 acres in size, of which about 34 percent is Wilderness.

Though lacking the formal designation, non-wilderness lands sometimes offer many of the same attributes for which wilderness areas were designated, such as opportunities for more primitive types of recreation, solitude, and natural conditions. In the Forest Plan, about 373,000 acres (16 percent) of WRNF were allocated to management emphasizing non-motorized, primitive and semi-primitive recreation opportunities. Together, designated wilderness and lands managed for non-motorized recreation account for 49 percent of the WRNF.

The CAT III area lies between two designated Wildernesses that receive considerable use during summer months. At their nearest points, the Holy Cross Wilderness is located about 5 miles to the west of the CAT III area, while the Eagles Nest Wilderness is about 3 miles to the east. The Holy Cross Wilderness (121,883 acres) is bounded on the north by I-70 and the Beaver Creek Ski Area, and on the east by U.S. Highway 24. Management responsibilities for the area are shared by the Holy Cross, Sporis, and Eagle Ranger Districts on the WRNF (93,930 acres) and by the Leadville Ranger District (8,960 acres) on the San Isabel National Forest.

The Eagles Nest Wilderness (133,915 acres) is located directly to the north and east of the TOV, Vail Pass, and I-70. Management responsibilities are shared by Holy Cross Ranger District (51,105 acres) on the WRNF and the Dillon Ranger District (82,391 acres) on the Arapaho National Forest. Visitors to the wilderness are provided with spectacular, rugged escarpments, 17 peaks over 13,000 feet, narrow mountain valleys, and numerous alpine lakes. Because of its beauty and accessibility to the entire Vail Valley, Summit County, and the Front Range metropolitan areas, many parts of the wilderness receive heavy use and experience associated impacts.

3.4.2.1.5 Roadless Areas

The term "roadless area" is one which has been the cause of considerable confusion. Its use originated in the Roadless Area Review and Evaluation (RARE II) process instituted by the Forest Service in 1977. The main goal of RARE II was to inventory and select roadless and undeveloped areas "to help round out the National Wilderness Preservation System (NWPS)" (USDA-FS 1979). Within a nationwide Environmental Statement, approximately 62 million acres were studied for possible inclusion in the NWPS. An area known as the Two Elk roadless area (16,360 acres) was a part of this review of 2,919 roadless areas across the United States. In the Final Environmental Statement (FES) released in 1979, all inventoried roadless areas were placed in three allocation classes: 1) wilderness, 2) multiple uses other than wilderness, and 3) needing further study for planning for all uses, including wilderness. The Two Elk area was allocated to multiple uses other than wilderness. Through this document, all areas allocated to non-wilderness were to be managed for a variety of other uses, effective April 15, 1979.

The RARE II FES was the impetus for a series of legal challenges and policy reviews that very much affect how roadless areas are treated in planning efforts today. Originally, the RARE II FES was interpreted by the courts as a commitment to develop areas identified for multiple uses other than wilderness, and a prohibition against examining wilderness features in project proposals. Later, Forest Service regulations were modified to allow for consideration of wilderness values in evaluating project proposals for lands that had been recommended for non-wilderness uses. This change clarified the fact that Forest Plan allocations are not an irreversible or irretrievable commitment of resources to develop; they only allow for certain activities to occur. This gave the Forest Service the discretion to consider a full range of alternatives in project planning, including not allowing any development and maintaining an area's roadless character. More recently, agency policy has been refined to specifically require that potential impacts to the roadless resource be analyzed in project-level NEPA documents. Frequently, this has led to the finding that the impacts of a proposed development in an unroaded area may involve a "significant" (40 CFR 1508.27) effect on the human environment and require preparation of an EIS, versus an Environmental Assessment.

Though the 1979 FES allocated many areas to a "wilderness" category, the authority to incorporate public lands as a part of the NWPS is reserved to Congress. The Colorado Wilderness Bill of 1980 (P.L. 96-560) moved forward with the recommendations in the 1979 FES and included 1,423,130 acres in Colorado as designated wilderness. Locally, this created the Holy Cross Wilderness, which is 126,000 acres in size.

In addition to formally including these areas as a part of the NWPS, Congress provided additional direction to the Forest Service in the Colorado Wilderness Bill in its management of lands allocated to multiple uses other than wilderness. This direction is generally referred to as "release language." It noted —

"Except for areas designated for further planning in forest management plans or as wilderness study areas by this act, national forest lands not designated for wilderness need not be managed for the purpose of protecting their suitability for wilderness designation. The Department of Agriculture shall not be required to review again the wilderness potential of national forests prior to revision of its initial land management plans."

The initial Forest Plan for the WRNF was put in place in 1984 (USDA-FS 1984). Consistent with the release language in the Colorado Wilderness Bill, the Forest Plan allocated all "non-wildernesses" to a variety of multiple uses. Depending on location, the former Two Elk roadless area was allocated to management emphasizing downhill skiing, semi-primitive motorized recreation, semi-primitive non-motorized recreation, and timber production. Consistent with the downhill skiing management area prescription, the ski area facilities in China and Siberia bowls were installed in 1988, even though this area was once under study in the RARE II process.

Based on comments received during scoping for this EIS, there appears to be a perception that undeveloped areas are afforded special status or have a formal designation. Ongoing management of the WRNF continues to be guided by the Forest Plan (USDA-FS 1984). There is no formal designation for undeveloped areas, other than what is provided for in the Forest Plan. Land uses that are approved must be consistent with the Forest Plan.

Preliminary steps are in progress to revise the White River Forest Plan. Currently, this revision is expected to be completed in 1999. In order to prepare for this effort, information is being collected to help support the revision. Included in this program are data relating to undeveloped or roadless areas. This effort and the term "roadless area" is not intended to imply any new status for these areas, it is simply an inventory term.

Undeveloped and roadless areas have inherent values. Comments received during scoping for this EIS served to highlight those values that the public identified as important for this proposal and are noted below.

- ◆ Provide habitat for threatened, endangered, Forest-sensitive, and other rare wildlife species (Wildlife and Biodiversity).
- ◆ Offer a habitat linkage to wildlife moving between wildernesses (Wildlife and Biodiversity).
- ◆ Protect a unique portion of the ecosystem (Wildlife and Biodiversity).
- ◆ Maintain opportunities for backcountry, non-motorized types of recreation (Recreation).
- ◆ Allow for additional areas of designated wilderness or for areas to study natural ecological processes, such as Research Natural Areas (Land Use).

Clearly, there is an overlap in the values that people commonly associate with undeveloped areas and the more traditional aspects of the physical and biological environment. Following each item above is a reference to the section in the EIS where detailed information can be found on this topic. As indicated, the potential for Research Natural Area designation is treated below.

3.4.2.1.6 Research Natural Areas

Research Natural Areas (RNAs) are a formal part of a national network of ecological areas designated in perpetuity for research and education, or to maintain biological diversity on NFS lands. They are defined as "a physical or biological unit in which current natural conditions are maintained insofar as possible. The conditions are ordinarily achieved by allowing natural physical and biological processes to prevail without human intervention" (FSM 4063.05). The process to designate a RNA is initiated under the terms of a 1979 Memorandum of Understanding between the Forest Service and the Colorado Natural Areas Program. To begin the process, the Forest Service must undertake a study to determine if the candidate area is suitable. National Forests are directed to include RNA suitability recommendations in Forest Plans, and amendments and revisions to Forest Plans. The authority to determine what important forest and range types are needed in the RNA system and formally designate RNAs is reserved for Chief of the Forest Service (FSM 4063[a]).

There are currently eight RNAs within Colorado (USDA-FS 1994g). During the development of the Forest Plan, no areas on the WRNF were identified as suitable, and no recommendations were made for the Chief to designate 69as RNAs. On August 1, 1990, the Forest Supervisor amended the Forest Plan and recommended that 322 acres on the Dillon Ranger District, known as Hoosier Ridge, be recommended to the Chief for designation as an RNA. To date, this area has not been so designated.

No suitability studies for RNA designation have been conducted in or around the CAT III area. Recommendations for future RNA designation are being identified under the current Forest Plan revision process for the WRNF. No potential areas have been identified in the vicinity of the PA.

3.4.2.2 Private Lands

3.4.2.2.1 Eagle County Master Plan (July 1994)

The issuance of a July 1994 draft of the Eagle County Master Plan culminated an effort to integrate the various regulatory and county support requirements into a comprehensive, working framework. The document reaches beyond the regulatory and administrative level, and establishes goals, planning guidelines, and implementing actions for land use and other concerns.

In the plan, Eagle County classifies itself as a resort/recreation based economy, and a significant portion of the document is devoted to mapping and discussion of planning and controls which would integrate such land use issues as: 1) wildlife habitat, 2) geologic features, 3) water supply and storage, 4) open space and recreation, and 5) development of public versus private land. For example, under the goal of "protecting the environmental quality of Eagle County," three of the five implementing policies directly address land use or protection of "natural land values" and other related resources. The County has also adopted an Environmental Impact Report procedure that requires land developers to formally inventory the environmental features of their property, technically evaluate impacts, and to then identify mitigation measures.

Colorado HB 1041 provides for an environmental review (full or minor) for areas and activities of local or state interest. This review process is required when proposed development would occur in designated geologic hazard areas, floodplain hazard areas, wildfire hazard areas, wildlife habitat areas, or historic and archaeological resource areas. There is no private land within the PA; however, about 6,446 acres of private land is located along the southwestern periphery of the LA. Any significant development of these lands would likely be required to go through the Eagle County 1041 process.

3.4.2.2.2 The Town of Vail

The PA is more than 5 miles from the TOV and is entirely on NFS lands. Therefore, there are no current zoning or land use concerns in the TOV that would have a direct effect on the Proposed Action or any alternative. Because about 90 percent of the land that has been zoned for development in the TOV has been developed, establishing priorities for residential, commercial, recreational and open space uses is a major land use issue there. Dedication of land to the provision of parking and other visitor-related services is another major land use concern in the TOV.

3.4.3 RECREATION AND ALPINE SKIING

Public lands provide the primary outdoor recreational opportunities in the Vail Valley. Approximately 80 percent of the total land base of Eagle County is federally controlled, managed by either the Forest Service or the Bureau of Land Management (BLM). Much of the non-skiing recreation is centered around the county's three ski resorts: Vail, Beaver Creek, and Arrowhead. The number of annual skier visits at these resorts has exceeded 2 million in recent years, which is roughly 20 percent of Colorado's total. Given these levels of demand, skiing remains the county's dominant recreational attraction. Downhill skiing accounts for approximately 45 percent of the total recreation visitor days on the WRNF.

The TOV, surrounded by more than 350,000 acres of public lands managed by the Holy Cross Ranger District, serves as a focal point for recreational activities in the area. In support of tourism, the town's retail mix includes more than 100 bars and restaurants, 300 shops, and a bedbase of more than 32,000. Lodging, services, and retail sales account for approximately 60 percent of the county's overall employment.

Although skiing remains dominant, the demand for non-skiing recreational activities has dramatically increased in recent years. While the number of downhill skiers on WRNF has shown modest growth, its percentage of total forest use actually declined by 5 percent between 1989 and 1992 (USDA-FS 1992) due to significant increases in the popularity of other activities such as biking and hiking.

An array of non-skiing activities is available to visitors of Vail Valley and surrounding areas, including mountain biking, hiking, camping, golf, tennis, fly-fishing along several sections of Gold Medal trout stream, rafting, and kayaking. Two Wildernesses, the Eagles Nest north of Gore Creek and the Holy Cross south of the Eagle River, provide abundant opportunities for wilderness recreation. A paved bike path connects the Vail Valley with the Summit County resorts of Copper Mountain, Breckenridge, and Keystone. In addition, the town has developed and promoted numerous summer events which have increased summer visitation. Various special events, including major golf tournaments, kayaking, and mountain biking competitions, have also contributed to an influx of visitors. In light of such successes, more events are planned in the future.

The growth in popularity of summer activities has begun to balance seasonal fluctuations in the economy and contributed to year-round increases in resident and tourist populations. Expanding populations, in turn, have generally brought new pressures to bear on the recreational resources provided by surrounding NFS lands. As the remaining parcels of open space in the Vail Valley are developed, adjacent Forest Service lands will play an increasingly important role for the recreational amenities they provide.

The remainder of this section describes popular recreation activities, roads, and trails in the LA. It concludes with a discussion of alpine skiing.

3.4.3.1 General Recreation

3.4.3.1.1 Roads and Trails and the Recreational Opportunities Spectrum

Figure 3.7. depicts roads and trails involved in the following discussion. Using the Forest Plan (USDA-FS 1984) and the Recreation Opportunity Spectrum (ROS), areas of national forest are designated to offer various types of recreational experiences. In large part, the ROS system is based on the level of human developments and motorized activity that occurs within a given area. Several ROS classes are assigned to lands within the LA. A "rural, roaded natural" ROS is assigned to many corridors containing a relatively high standard road. In locations where a less developed road system is in place, the area is designated as "semi-primitive motorized." Areas where no roads are located and the intent is to provide an even less developed setting are designated as "semi-primitive, non-motorized." A "primitive" classification is assigned to the ROS in designated wilderness, although no wilderness lies within the LA. The Forest Plan has not assigned ROS classification to lands under SUP for ski area purposes, including the CAT III area. However, based on the character of the area and the low level of development, the CAT III area currently provides a semi-primitive, non-motorized setting. This ROS class is what many would call "backcountry." Consequently, that term is used throughout this section. A small portion of the CAT III area is adjacent to the base terminal of Lift 21 and the lowest section of Sleepytime Road. Again, though lacking a formal ROS classification, this portion of the CAT III area could be thought of as offering a semi-primitive, motorized setting.

On the front side of the Vail Ski Area, VA offers 23 trails, totaling nearly 59 miles in length. These trails are designed and maintained for a variety of purposes including: "hiking only," with eight trails totaling 13.2 miles; "biking only," with four sections totaling 14.5 miles; and "multiple use," with eleven sections totaling 30.9 miles. Within this mix of uses, there are also opportunities for the physically challenged, as well as programs for guided interpretation and education.

Connected to this network of trails are several longer trails originating outside the ski area boundary. Two of the more important, the Two Elk and Commando Run trails, which are managed by the Forest Service, are discussed in detail below. In addition, the Game Creek Trail, beginning outside of Minturn, receives moderate amounts of hiking and mountain biking use. Forest Service Trail 711 has been historically a jeep trail, but current use is largely mixed between hiking and mountain biking.

The Two Elk National Recreation Trail, running 9 miles east to west along the northern boundary of the CAT III area, provides non-motorized access to the entire Two Elk basin. Use originates primarily from one of two trailheads: Gore Creek and I-70 to the east, and Eagle River and U.S. Highway 24 to the west. However, access can also be gained from the Sleepytime Road and Commando Run Trail. The trail receives substantial use during its short use-season. According to 1994 trail register data, use between July 1 and September 15, 1994, was estimated at 2,594 people, of which 63 percent started from the Vail Pass trailhead and 37 percent from the

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**Eagles Nest
 Wilderness**

**WHITE RIVER
 NATIONAL
 FOREST**

**Eagles Nest
 Wilderness**

***Note:**

A more extensive road & trail system occurs in the CAT I area but is not depicted on this map.

Road & Trail Key:

- Highways & Paved Roads
- Unpaved Roads
- 4-WD Road
- Non-Motorized Trails
- Railroad

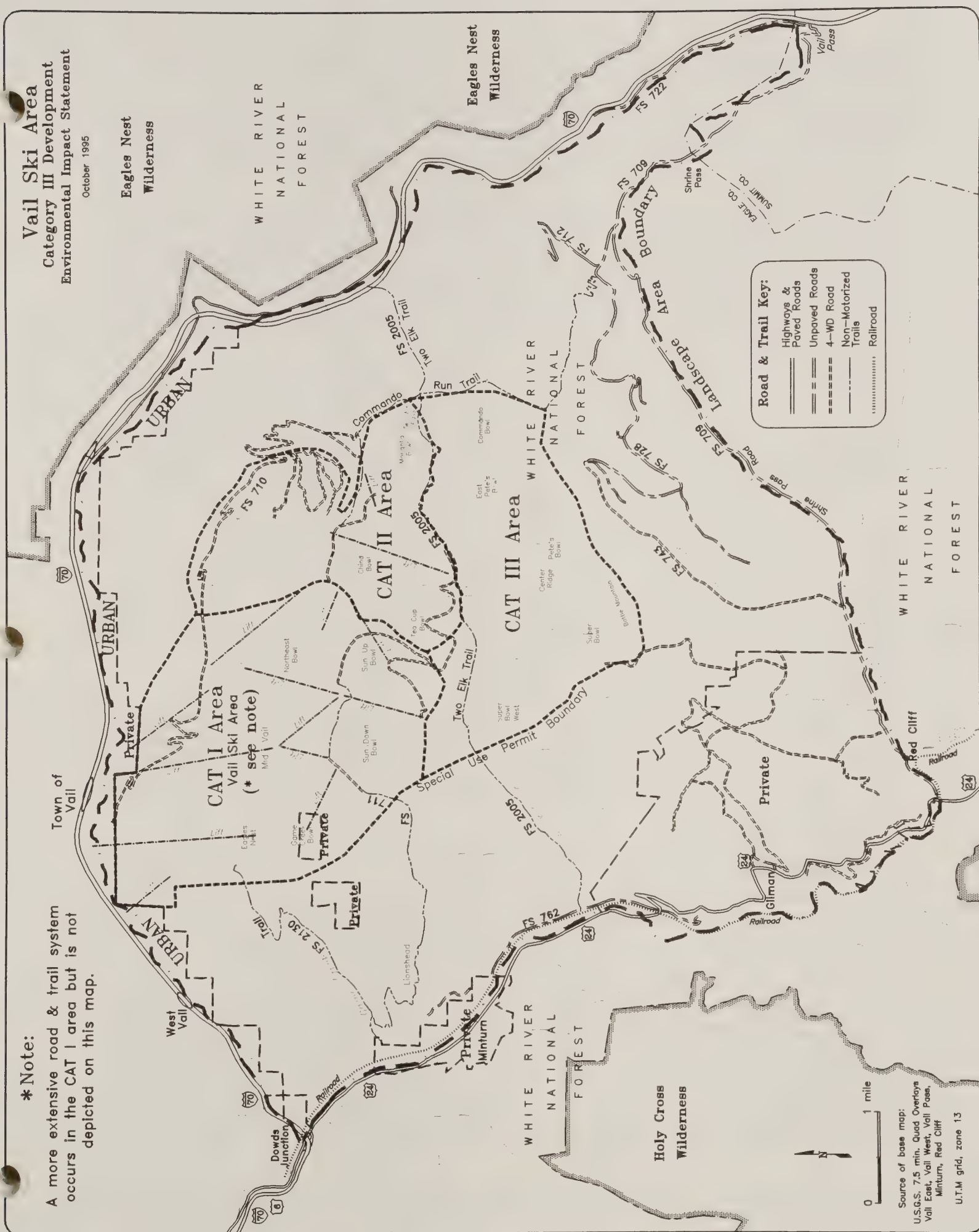


Figure 3.7. Roads and trails in the LA.

Minturn trailhead. The trail was designated as a National Recreation Trail in 1979 (USDA-FS 1979). It was previously open to motorcycles. No specific management guidelines or restrictions are provided under such status, but future actions should not detract from the trail's long-term recreational purposes and visual quality objectives.

The Commando Run Trail, connecting Shrine Pass with the TOV, is a popular backcountry route in the area. Much of the trail is forested, but spectacular views are provided of the Gore and Sawatch Ranges, as well as of Mongolia Bowl. The trail defines the eastern SUP boundary of the Vail Ski Area in the vicinity of Commando and Mongolia Bowls, and travels through the ski area in Mongolia Bowl and Mill Creek before finally descending into the TOV. Along its length, the Commando Run Trail follows a route of widely varying standards and types of use. Along Shrine Pass, the route overlays the Turkey Creek Road (FS #709). From the intersection with Lime Creek Road (FS #743) to the top of Red Mountain in Mongolia Bowl, the trail is a relatively narrow "single-track" tread. From Red Mountain through most of the Mill Creek drainage, the trail is actually a jeep road (FS #710). The lowest segment of the Commando Run Trail continues on the Mill Creek Road through the developed ski area and into the TOV. The portion of the trail which connects Lime Creek with the Mill Creek Road is not an official Forest Service trail, though levels of use are thought to be moderate. The trail users are mainly hikers, hunters, mountain bikers, backcountry skiers, and occasional horseback riders. Most people are attracted by the trail's accessibility, challenge, elevation drop, and relatively undisturbed backcountry character.

Within the LA is a system of roads, originally developed for such purposes as timber management, mining, or ski area operations and maintenance. With the exception of Mill Creek Road, all roads within the ski area are closed to public motorized travel. In the Back Bowls, the Sleepytime Road provides one route from the top of Vail Mountain to Two Elk Creek, from which access is gained to Two Elk Trail, Commando Run Trail, and the CAT III area. The Lime Creek Road travels along the south side of Battle Mountain. Upper sections of what becomes the Mill Creek Road provide a connection between the Commando Run Trail and the TOV. A jeep road, not appearing on maps, provides a route from near Red Cliff to the ridge above Super Bowl.

In order to protect elk calving habitat, recreation and administrative access to the China Bowl is restricted May 1 through June 30. Each year, a gate and informational sign are provided and placed by VA on Sleepytime Road near the top of Vail Mountain. The closure is considered to have been largely successful, due in part to on-mountain educational efforts. It should be noted that, while accumulations of snow tend to negate much of the early season use, there are currently no closures in place that restrict access from either end of the Two Elk or Commando Run trails.

3.4.3.1.2 Backcountry Skiing

Backcountry skiing has become increasingly popular in the CAT III area, especially along the Commando Run Trail. The Commando Run Trail is about 18 miles long and provides a challenging backcountry experience to skiers traveling from the popular Vail Pass area to the TOV. Some skiers occasionally detour from the Commando Run Trail and ski the glades in Commando Bowl, connecting with the main trail again near Two Elk Pass. In ascending Red Mountain from Two Elk Pass via Mongolia Bowl, the trail extends through a developed portion of the ski area. From the summit of Red Mountain, skiers are able to see the Gore and Sawatch ranges, as well as most of the CAT II and III areas. The final descent involves traversing into Benchmark Bowl for the 8-mile, 3,200-vertical-foot return to the TOV.

Following discussions with the Colorado Mountain Club, the SUP boundary for the Vail Ski Area was adjusted (USDA-FS 1986a) in the Benchmark Bowl area in order to reduce potential conflicts between users of the

Commando Run Trail and ski area operations. Some backcountry skiers who leave the main Commando Run Trail route and ski Commando Bowl find themselves in an avalanche-prone area (Figure 3.10). In the past, ski area personnel have performed rescues of backcountry skiers in this area. Backcountry skiers sometimes avoid the difficult ascent of Red Mountain and instead use Lift 21 to access the top of Vail Mountain.

The Vail Pass/Shrine Pass use area experiences intensive skier and snowmobile use during the winter months. The appeal of the area is its accessibility. The Commando Run Trail, in particular, is considered a fairly unique resource within the WRNF, because motorized activities are relatively uncommon along portions of it, and because it is also relatively easily to access. However, its length, along with the various rigors of backcountry skiing, effectively limit the number of people capable of traveling this route. Nonetheless, several dozen people travel the route each weekend between mid-winter and spring, and use is thought to be growing.

3.4.3.1.3 Outfitter/Guide Activities

Several commercial outfitters and guides, whose activities are authorized under SUP by the Forest Service, operate on lands adjacent to or within the CAT III area. Six permittees have been approved for operating within the Shrine Pass and Vail Pass areas. These operations provide their clientele with a variety of services, including snowcat skiing tours, snowmobile tours, jeep tours, cross-country skiing tours, snowshoe tours. In the vicinity of the PA, these trips are confined to the Commando Run Trail and/or Two Elk Trail.

3.4.3.1.4 Mountain Biking

Biking has become one of the fastest growing recreational activities on the WRNF. The bike path connecting the TOV with Summit County is partly responsible for increased use levels. However, much of the increase is the direct result of the soaring popularity of mountain biking nationwide. On a local level, promotional efforts by VA and other local businesses have helped raise an awareness and appreciation of local mountain biking opportunities. The Vail Ski Area has twice been the site of world class mountain biking events. Such events have further amplified growth trends in the sport and contributed to major increases in summer tourism. For instance, two-day attendance at one competition was estimated at 40,000 people, which generated substantial revenues to the local service industry. Press and television coverage provided widespread exposure to a large pool of potential visitors. Given such overwhelming success, the Vail area will continue to be a venue for mountain-bike racing.

Mountain biking is popular throughout the Vail Valley, but the Vail Ski Area in particular holds strong appeal for summer visitors. Bike transports on lifts is estimated to have increased by 141 percent between 1989 and 1993 (VA 1994b). Most use occurs on the front side along a series of single-track trails and ski area access roads. The rider skill levels vary greatly, but a majority of riders on these trails are less experienced than those using other trails in the area. To reach these routes, people either bike up the mountain or take advantage of summertime lift service provided on the Gondola and Vistabahn.

Little mountain biking occurs within the main part of the CAT III area. However, it is a relatively popular activity along its periphery on the Commando Run and Two Elk trails. To reach the Two Elk Trail, some mountain bikers descend Sleepytime Road from the top of Vail Mountain. As a group, these riders are generally more advanced and are often local riders. From the Vail Ski Area, bikers can make their way down Sun Up and Tea Cup bowls via Sleepytime Road and gain access to Two Elk Trail, from which several options are available. Most bikers ride west along the Two Elk Trail to Minturn or return to the TOV via Sleepytime Road and routes

on the front side of the ski area. The Two Elk Trail extending west from the base of Lift 21 is a technical route used mostly by advanced riders.

A popular option involves parking at Vail Pass and riding the single track of the Commando Run and Two Elk trails. The section of the Two Elk Trail between Two Elk Pass and I-70 has minimal appeal to bikers as an ascent route because of steep grades. It is, however, sometimes used as a descent route from the Two Elk Pass or Commando Run Trail because it provides a connection back to Vail Pass.

VA is planning to host additional national and international mountain biking competitions in the future. All these trends suggest increased demand for extended riding and training opportunities in close proximity to the TOV.

3.4.3.1.5 Hiking

In the Vail Valley, many recreational opportunities are located within the Eagles Nest and Holy Cross Wildernesses. Together they provide visitors with the opportunity to explore 255,986 acres of alpine peaks, meadows, lakes, streams, and forests. Access to this terrain is provided by 355 miles of hiking and stock trails. Twenty-nine of the more than 54 four trailheads are located within a 30-mile drive of the Vail Valley, along the I-70 and U.S. Highway 24 corridors.

Hiking is also a major activity in the immediate Vail area. To promote use of 13.2 miles of hiking trails and 30.9 miles of multiple use trails that are developed across Vail Mountain, lift service is provided to the mid-mountain and summit via the Vistabahn Lift and the Lionshead Gondola. Hikers can either hike up and down, use lift-service up and hike down, or use lift service up, hike, then use lift service down. Upon reaching mid-mountain or the summit ridge, hikers can enjoy scenic vistas, view and photograph nature, and observe wildlife. The season of operation generally lasts from May until October.

Hiking is generally restricted to the periphery of the CAT III area, usually on either the Commando Run or Two Elk Trail. There are no designated or established hiking trails in the main part of the CAT III area, although there is some off-trail use. A very limited amount of dispersed camping has been observed, mostly during the fall hunting season.

3.4.3.1.6 Fishing

Two Elk Creek, a tributary of the Eagle River, is the only identified fishery within the CAT III area. While Two Elk Creek does support a viable brook trout fishery, the creek is not often fished. Several factors are responsible for the creek's low use, including its small fish sizes, relative inaccessibility, low summertime water flow, and dense thickets of willow. While there are few quality fishing opportunities within the PA, sections of the Eagle River, as well as portions of Gore Creek, offer high-quality fisheries that receive a substantial amount of use.

3.4.3.1.7 Hunting

Levels of hunting in the PA are similar to those in the surrounding region. In most cases, hunters park and camp along the Lime Creek Road and enter the PA on foot or horseback for the day. Isolated overnight camps have been observed in the Commando Bowl area during hunting seasons. The PA is also used by grouse hunters in September.

3.4.3.2 Alpine Skiing

3.4.3.2.1 Introduction

The purpose of this section is to provide the background information necessary to understand the assessment of impacts to alpine skiing potentially resulting from implementation of the Proposed Action and alternatives addressed in this EIS. This section is not intended to provide a comprehensive description of Vail Ski Area's infrastructure, services or resources. For this broader information, the reader is encouraged to consult planning documents, particularly VA's 1985 MDP and 1987 MDP revision.

The alpine skiing topics addressed in this analysis were derived in two ways. First, the stated purpose of the proposed CAT III area development comprises various improvements in alpine skiing, and assessment of these improvements is a key objective of this analysis. Second, public and agency scoping identified several issues regarding alpine skiing. Pooling these topics yielded the following list:

- ◆ Need for the development in terms of supply and demand for alpine skiing opportunities;
- ◆ Overall quality of skiing at Vail Ski Area;
- ◆ Ski area capacity;
- ◆ Reliability of skiing, particularly during early and late season shoulders and when conditions can limit use of the Back Bowls;
- ◆ Match between terrain difficulty and skier ability levels;
- ◆ Skier densities at key areas on the front side of the ski area;
- ◆ CAT III area access and services; and
- ◆ Skier safety and management.

Current background conditions regarding each of these topics are outlined below. The assessment of associated impacts is presented in Chapter 4, Alpine Skiing.

Related concerns regarding the economic benefits of increased skier numbers were expressed during scoping. They are addressed in this EIS under the heading of Socioeconomics.

3.4.3.2.2 Need for the Project

The section on Need for the Proposal in Chapter 1 of this EIS outlines in general terms elements of the Rocky Mountain Regional Guide and Forest Plan which specifically address the CAT III area development. That section also notes that the development is described in the ski area's accepted MDP, but cites the Forest Service stipulation (USDA-FS 1986a) that VA submit a detailed, site-specific proposal for environmental review prior to initiating it.

Between 1986—when these original decisions regarding the development were made—and the present, concern has emerged over the need for more ski area development on NFS land in light of recent trends in skier numbers. Further, the Forest Plan stipulates that the balance between supply and demand for alpine skiing must be considered in decisions regarding authorization of ski area development. For these reasons, need for the project is assessed in terms of supply and demand below.

The Forest Service recently assessed the balance between supply and demand for alpine skiing on Colorado's NFS lands in the *Snowmass Ski Area Final Environmental Impact Statement* (Snowmass EIS)(USDA-FS 1994g). That detailed analysis is hereby incorporated by reference into this analysis. Key points are summarized below, with updates and other supporting information as appropriate.

3.4.3.2.2.1 Demand

At the national level, skier numbers grew slowly until the 1960s, then began to increase dramatically, with annual growth rates averaging 16 percent. The ski industry matured in the 1970s, and growth rates tapered off to about 10 percent. The 1980s brought adverse weather conditions, a slowing economy, and changes in attitudes toward recreation which resulted in increased variability in annual participation and an overall slowdown. This variable trend has carried into the 1990s. Current projections suggest modest growth in skier numbers over the coming decade, probably at annual rates between 0.75 and 1.5 nationally. This would equate to 4 million to 9 million additional skier visits being generated between 1992/93 and 2002/03. (USDA-FS 1994g.)

Slower growth and aging in the U.S. population are major factors in current low growth rates according to most analysts. However, there are signs that the limiting influence of these trends may decrease, as people in our increasingly health-conscious society take up the sport later in life. Since 1986, older skiers have comprised a higher percentage of the skiing population. Further, the U.S. is experiencing the greatest upswing in the number of babies born since the peak of the baby boom, which could mean the recent downward trend in numbers of new, young skiers may not be holding. (USDA-FS 1994g.)

Also at the national scale, skiers tend to be increasingly discriminating, as indicated by most recent marketing studies. Successful ski areas are responding by focusing on qualitative aspects of the on-mountain experience, including new, high-speed lift technology, snowmaking, a broad array of trails at all ability levels, and comfortable skier-support facilities.

Cumulatively, these observations suggest that recent slowing in the rate of growth in national skier numbers are not necessarily indicative of longer-term trends. More importantly in the case of this proposal, they show that quality rather than quantity is an ever-more-critical aspect of maintaining or increasing skier visitation. While the quality rationale is more relevant to the CAT III area development proposal, as outlined under following headings in this section, the remainder of this discussion will focus primarily on need in quantitative terms.

Describing recent demand trends in the Colorado skier market, the Snowmass EIS notes that Colorado has continued to buck national trends, with steady growth in skier numbers and in market share. The slowing trends in the late 1980s were reversed early in this decade, when skier visits grew by 6.1 percent in 1991/92 then by 6.7 percent in 1992/93. The majority of this growth in demand came from destination rather than day skiers. Since 1992/93, the last season addressed in the Snowmass EIS, growth has fallen off again, changing negligibly in 1993/94 and 1994/95. The 10-year average for the state, ending in 1994/95, is just over 2 percent.

Eagle County ski areas have experienced growth in excess of the state average over the medium term, with visitation up by about 650,000 visits—or 44 percent—since 1983. Growth in the short term has approximated the state average at about 5 percent per annum for the past five seasons. (USDA-FS 1995c.)

The Vail Ski Area has roughly tracked Colorado trends, though season-to-season shifts have tended to be smaller during recent years. The area did not match the statewide growth rate experienced in 1991/92 and 1992/93, and numbers fell off more sharply than average in 1993/94. From 1993/94 to 1994/95, Vail skier visits increased notably, while the Colorado total declined slightly. The Vail Ski Area's 10-year average annual increase through 1994/95 is just under 2 percent. Overall, for the past several years, the ski area has fallen off statewide norms over a period when destination resorts have lead the market, though 1994/95 was an exception. Table 3.12 compares the Vail Ski Area's visitation growth rates with Colorado's totals for the 1990s.

3.4.3.2.2.2 Supply

Supply of skiing opportunities is more difficult to assess objectively. The *Rocky Mountain Regional Guide Supply and Demand Assessment* (Supply and Demand Assessment) (USDA-FS 1992d) estimated 1990 capacity in the region at 162,550 SAOT and predicted that capacity would grow at a rate between 1.75 and 5.2 percent per annum until 2000. This is based on 1990 in-place capacity expanded pending environmental reviews and plan approvals of expansions and new developments indicated in the Regional Guide. These include the CAT III area development.

Table 3.12. Comparison of annual growth rates in skier visits between the Vail Ski Area skier visits and Colorado totals, 1990/91-1994-95.					
	89/90-90/91	90/91-91/92	91/92-92/93	92/93-93/94	93/94-94/95
Colorado total	0.9%	6.5%	6.1%	0.5%	-0.5%
Vail Ski Area	0.9%	0.2%	2.0%	-2.7%	2.3%
Source: RRC Associates, unpublished 1995 data.					

It should be noted that Geneva Basin, Cuchara Valley, and Mountain Cliff, which were included in the 1990 capacity estimate, have since closed, bringing to 10 the number of small ski areas going out of business since 1982. Further, the SUP has been revoked for the East Fork Ski Area, with a planned capacity of 13,500 SAOT, and a number of new ski areas or expansions, including Lake Catamount and Adam's Rib Recreation Area, are on hold or behind schedule. These changes should be considered in interpreting the Supply and Demand Assessment's projections of supply, though overall the Regional Guide's projections and the strategies based on them have proven accurate over the long term.

3.4.3.2.2.3 Balance Between Supply and Demand

Assessing the balance between supply, expressed in actual or approved SAOT, and demand, expressed in skier visits per season is difficult. Average utilization, calculated by dividing actual seasonal skier visits by the sum of SAOT capacity for a 140-day season, is a useful figure in this regard. The Snowmass EIS indicates that from 1986/87 through 1992/93, Colorado skier visits grew by 18.1 percent, while capacity in terms of SAOT gained only 14.5 percent. This has resulted in average utilization increasing from 39.6 to 45.2 over the same period.

This indicates high levels of utilization by industry standards, suggesting that there is no notable surplus of skier capacity in Colorado.

At its current approved capacity, the Vail Ski Area's utilization rate is almost 59 percent (USDA-FS 1994g). This indicates less surplus capacity at Vail than at most ski areas in Colorado or elsewhere.

This information provides the background for assessing whether there is need for the CAT III area development based on the balance between supply and demand and how the alternatives being considered would address such a need.

3.4.3.2.3 Skiing Quality

The Vail Ski Area is one of North America's premier ski resorts, attracting a blend of local and Front Range day skiers and destination skiers from the U.S. and abroad. In contrast to other Colorado ski areas, Vail skiers tend to be older and include more professionals in higher income brackets, though skiers of all categories contribute to the ski area's 1.5 million annual visitor days (Eagle Co. 1994). Foreign skiers comprise nearly 12 percent of annual skier visitation (TOV 1994a). Overall, the quality of Vail Ski Area's skiing experience has been the central factor in the ski area's consistently strong performance as a cornerstone of the U.S. ski industry.

Keys to the Vail Ski Area's success in attracting day skiers from the Front Range metropolitan corridor are ready access on I-70 coupled with high-quality ski terrain, snow, lifts, skier services, and other on- and off-mountain amenities. Additional attractions for destination skiers include: easy air access via Eagle County or Denver International Airports; expansive and diverse ski terrain, featuring the unique Back Bowls, which invites longer stays by providing a wider range of opportunities; outstanding lodging, dining, and après-ski activities; and many recreational alternatives to alpine skiing.

Maintaining a competitive position in the face of changing skier preferences, new ski-area technology, shifting economies, and competition from other resorts requires constant adjustment and refinement of the Vail Ski Area's product. VA's desire to create and maintain a market niche on the basis of the quality of the skiing opportunities they have developed is an important consideration in this proposal.

Most of the previously approved developments which have been completed or are scheduled for the next couple of years center on improvements to skier circulation and more efficient utilization of the CAT I and CAT II areas. These are described in VA's 1985 MDP and 1987 MDP revision. CAT III area development, as originally planned and currently proposed, is intended to incorporate the remaining SUP area into the ski area, optimizing the quality and dependability of the alpine skiing experience offered.

While there are no developed ski facilities in the CAT III area, VA has operated limited snowcat tours in the area since 1992 to assess its potential. This effort has clearly demonstrated the CAT III area's potential to provide a fundamental, qualitative addition to the Vail Ski Area's alpine skiing product. The CAT III area affords more effective utilization of the ski area's SUP. Its natural glades and open bowls provide a rare and sought-after skiing experience accessible to skiers of various ability levels. In short, use on a trial basis has indicated that the CAT III area could significantly increase the diversity and quality of alpine skiing at Vail Ski Area.

3.4.3.2.4 Ski Area Capacity

Ski area capacity in itself is not a major factor in this analysis because VA has not proposed any change to the existing 19,900 SAOT manage-to approach established through the NEPA process on VA's MDP in 1986 and reaffirmed in the Agreement (TOV/VA 1995). The manage-to approach provides a flexible framework involving the Forest Service, the TOV, and VA in managing peak days. Details of the approach are presented in Appendix A. All alternatives discussed in this EIS incorporate the current manage-to capacity of 19,900 SAOT. Increases beyond this capacity are outside the scope of this EIS.

In this context, VA's proposal is properly viewed as a means of providing new and different terrain, improving diversity and terrain mix, and improving skier circulation thereby enhancing the quality of the skiing experience at Vail Ski Area. While capacity would increase with the proposed development, the increase would not change the number of skiers the ski area would accommodate because the 19,900 SAOT manage-to capacity will remain in force. However, the theoretical capacity increase should be assessed to set the stage for describing and assessing impacts to related topics. The current capacity situation is outlined in the following section.

3.4.3.2.4.1 Trail Capacity

A range of methods—including SAOT, mechanical lift capacity, out-of-base lift capacity, restaurant and restroom capacity, and other infrastructure measures such as parking, bed base and general services and amenities—can be used to gauge and describe ski area capacity. In this case, trail capacity, calculated on the basis of skiable acreage and anticipated skier densities, is the logical measure to use in assessing development of new terrain since it is based directly on land area rather than more abstract and alterable factors such as lift capacity, base-area capacity, or bed base. The skier densities used in calculating trail capacity in this analysis are consistent with the Quality Management Guidelines (VA 1986) established by VA. Table 3.13 depicts the current trail capacity by terrain class at Vail Ski Area.

Skier densities used in these calculations for the Back Bowls are reduced because of two related factors. First, densities are generally higher on a per-acre basis on groomed trails than on open terrain. This reflects natural dispersion to a large degree, but it is also consistent with management considerations and skier expectations. Second, uncrowded skiing in glades and open bowls such as the Back Bowls is a key component of Vail Ski Area's attraction, and VA actively manages to retain it.

As is indicated in Table 3.13, the trail capacity for the front side of Vail Mountain is estimated at about 14,258 skiers. The trail capacity in the Back Bowls is approximately 7,824 skiers. However, current lift capabilities actually limit this more realistically to about 3,645 skiers. Interestingly, subtracting the front-side capacity of 14,258 from the 19,900 manage-to capacity leaves 5,642 skiers to be accommodated in the Back Bowls. With the lift constraint of 3,645 skiers, this indicates an existing overall capacity deficit of 1,997 skiers.

In terms of trail capacity alone—without considering terrain mix, reliability of skiing, or limitations of lift service and village infrastructure—these figures indicate that the ski area currently has a maximum trail capacity of 22,082 skiers.

3.4.3.2.4.2 Capacity Utilization

Another capacity-related issue under consideration is the degree to which existing capacity is utilized by skiers. This is the key to the potential for increased annual skier visits with the 19,900 SAOT manage-to program in

place. Figure 3.8 indicates the profile of daily skier visits at the Vail Ski Area averaged across five seasons from 1988/89 to 1993/94. Peak periods around Christmas and New Year's and during spring break are evident. On a finer scale, the difference between weekends and mid-week periods is clear. Three-day weekends associated with holidays strengthen this pattern.

Table 3.13. Current trail capacity by terrain class.¹												
	Beginner			Intermediate			Advanced			Total		
	Acres	% ²	Capacity	Acres	% ²	Capacity	Acres	% ²	Capacity	Acres	% ²	Capacity
Front Side	416	44	6,240	469	33	4,690	416	23	3,328	1,301	100	14,258
Back Bowls	36	2	180	951	43	3,329	1,726	55	4,315	2,713	100	7,824
Total	452	29	6,420	1,420	36	8,019	2,142	35	7,643	4,014	100	22,082

¹Trail capacity is a theoretical measure, since the 19,900 manage-to capacity actually limits visitation.
²Percentage of capacity, not acreage, in this terrain class.
Source: Vail Associates, unpublished 1995 data.

This basic profile, with clear holiday and weekend peaks and mid-week lows, is consistent with most ski areas. Where Vail Ski Area differs from many other resorts is in the high level of visitation maintained in spite of these standard fluctuations. The large area under the curve when weekends and holiday peaks are disregarded indicates the large proportion of destination skiers in the visitor mix. These skiers generally stay longer than a weekend, and their visits are not as tightly confined to peak periods. Conversely, the sharp spikes at peak periods and weekends reflect primarily day-skier visits. The spiked pattern indicates underutilization of existing on- and off-mountain infrastructure. Together with the relatively large area above the curve up to the 19,900 manage-to level, this indicates a considerable margin in which to expand annual skier visitation. A key aspect of VA's proposal is building annual skier visitation, particularly by attracting more destination skiers.

3.4.3.2.5 Reliability of Skiing

As indicated in Table 3.13, 35 percent of Vail Ski Area's trail capacity is contained in the Back Bowls. This area is generally south facing, open, and more exposed to wind than the front side of the mountain. Collectively these factors can create conditions which limit the reliability of the skiing opportunity afforded by this area.

Adequate snow cover usually accumulates later, so the Back Bowls typically open several weeks later than the front side. Snow retention is also problematic, and snow depth has been below the minimum required during the key Christmas/New Year's peak four times in the last 9 years according to VA's snow-depth data. These data indicate that during the past 31 years, the Back Bowls have not opened eight Christmas seasons because of inadequate snow, and conditions have been marginal another five seasons. The Back Bowls have not opened until late February during four seasons.

The Back Bowls' southern exposure results in greater day/night temperature fluctuations which can work against good snow conditions. Also, when heavy or blowing snow or fog occur, the open terrain does not provide skiers adequate visual reference to ski comfortably.

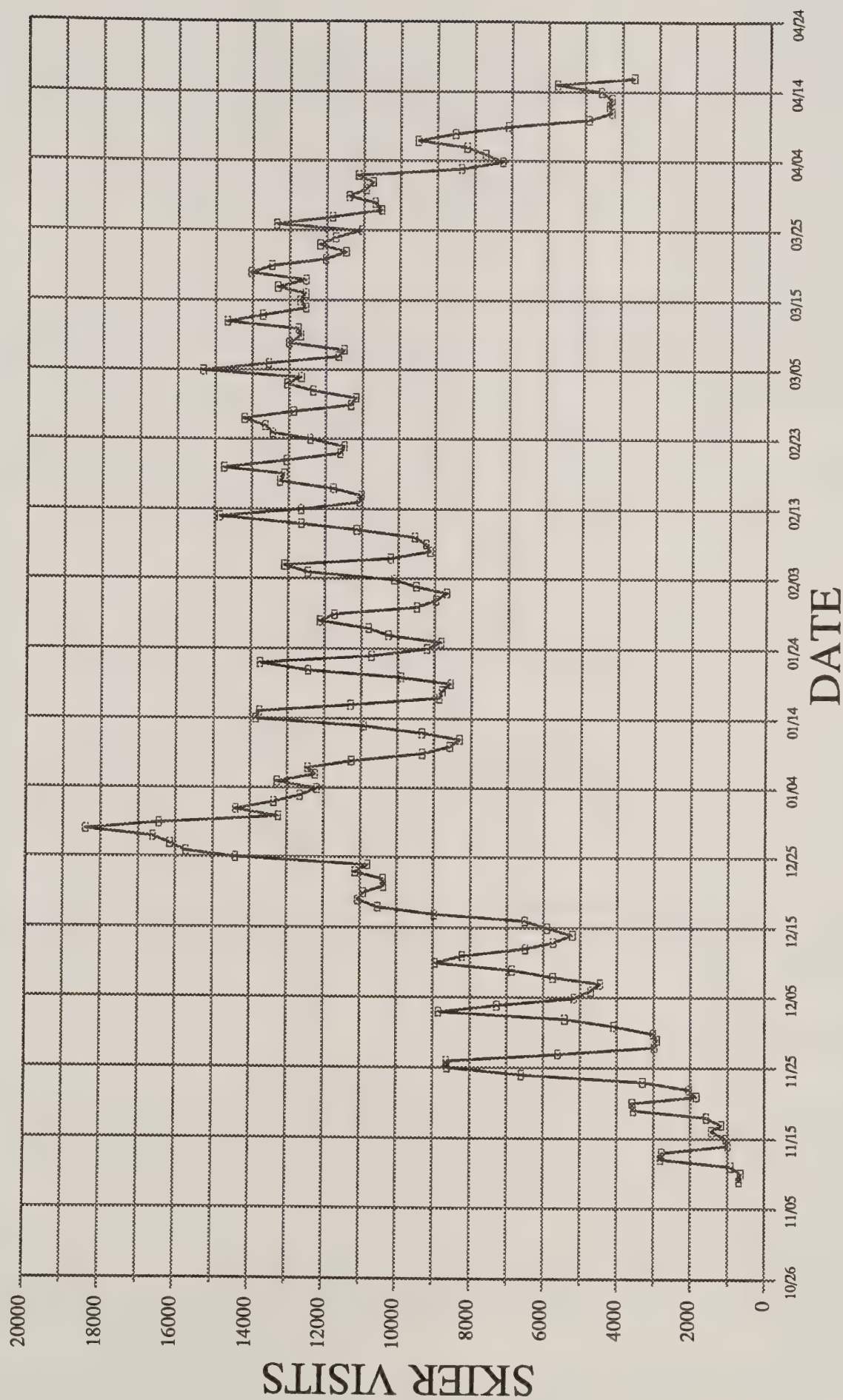


Figure 3.8. Average daily skier-visit profile, 1989-94.

In short, adverse conditions in the Back Bowls can easily restrict most skiers to the front side of the mountain. This translates to significantly reduced overall trail capacity and terrain variety. When this occurs during seasonal peaks or weekends, crowding occurs on the front side, and the overall quality of the skiing experience suffers.

Terrain opportunities throughout the SUP area have been explored to develop a more reliable product. Only the CAT III area offers significant opportunity to offset the inherent limitations of the Back Bowls.

3.4.3.2.6 Terrain Mix

Marketing studies from the 1994/95 season indicate that about 50 percent of Vail Ski Area's skiers rate themselves as intermediates. As indicated in Table 3.13 above, only about 36 percent of the ski area's trail capacity is rated as intermediate. This indicates that on peak days there is potentially a deficit in intermediate terrain. To quantify this deficit, 50 percent of 19,900 skiers is 9,950 skiers, which is 1,931 more than the area's intermediate terrain currently accommodates under VA's Quality Management Guidelines. Further, when the Back Bowls are not available, the shortfall of intermediate terrain increases to 5,260 skiers. This is an oversimplified approach, but it provides a basis for assessing this potential problem. Industry figures suggest an aging trend toward an older skiing population and an associated increase in the proportion of intermediate skiers. Therefore, Vail Ski Area's deficit of intermediate terrain can be expected to grow.

3.4.3.2.7 Skier Densities

The skier density concerns identified during scoping centered on two perceived problems which could be associated with the CAT III area development: crowding on major egress routes in late afternoon, and crowding in the Mid-Vail area, particularly around mid-day.

In regard to egress, a circulation capacity study being completed by VA (Larson 1995) indicates that one trail, upper Flapjack, which is associated with egress from the Back Bowls and the CAT III area poses a potential problem in terms of inadequate end-of-day capacity on days when the ski area is near the manage-to capacity. The study suggests that this problem can continue to be handled through implementation of passive skier management measures.

There is less potential for the CAT III area development to affect congestion at Mid-Vail. Located at the top of the Vistabahn and the base of lifts 3 and 4, the area is one of the busiest on the mountain. Mid-day skier movements coupled with the attraction of one of the largest and most popular restaurants on the mountain make crowding more severe on peak days.

3.4.3.2.8 CAT III Area Access and Services

A concern expressed during scoping is whether the CAT III area is too far from the base area to be practically accessed and supported by existing ski area infrastructure, particularly lifts. Since the CAT III area is adjacent to the Back Bowls, the accessibility of the bottom of the Back Bowls provides a reference for the accessibility of the CAT III area. Major access routes and transit times to the bottom of China and Sun Down Bowls are indicated in Figure 3.9.

It is important to note that even when snow or weather conditions limit use of the Back Bowls as noted above (Reliability of Skiing), there is generally enough snow to make the Sleepytime Skiway/Road skiable, thus assuring access to the CAT III area under most conditions. High speed lifts have made access to the Back Bowls, and

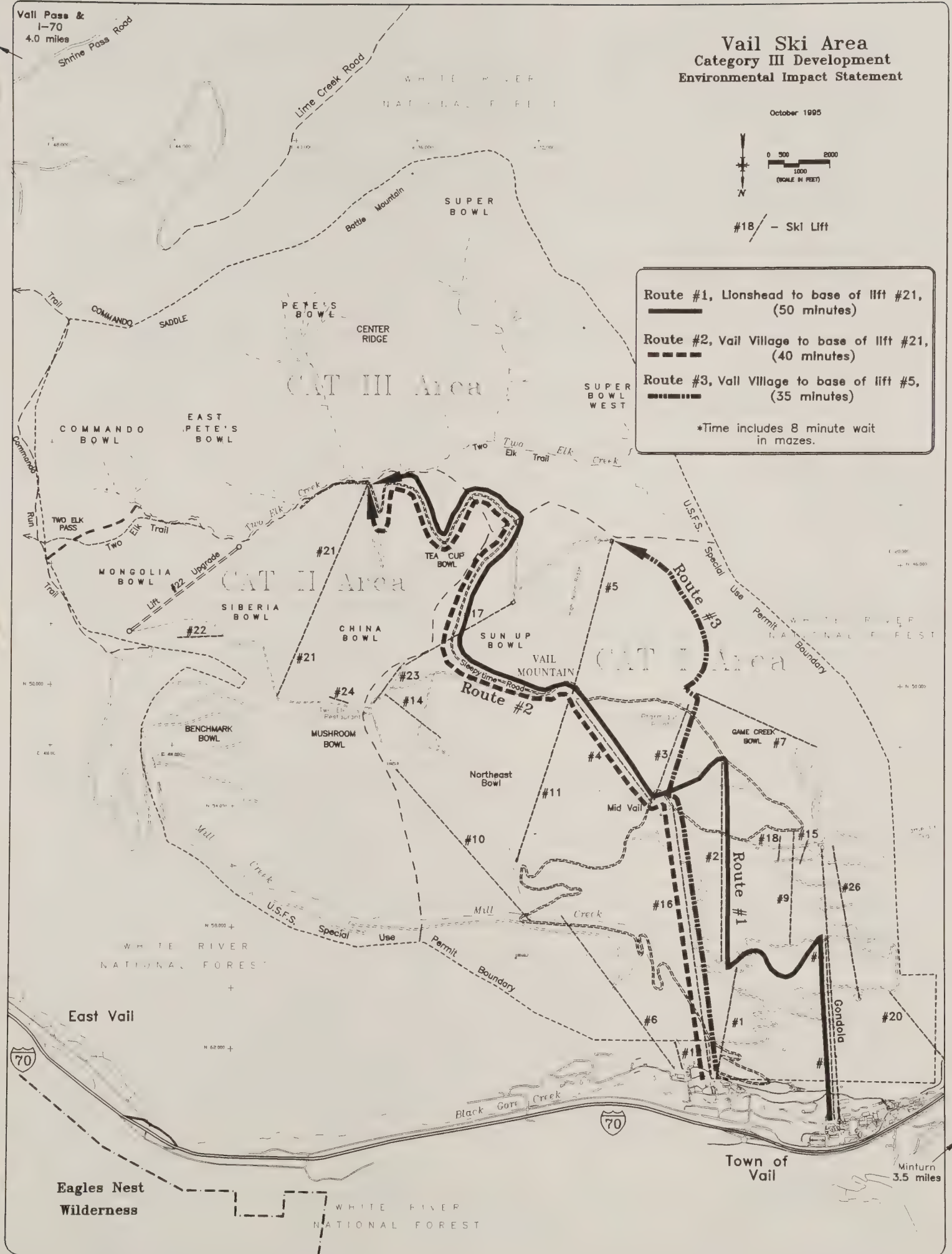


Figure 3.9 Major routes and transit times to the bases of China and Sun Down bowls.

hence to the CAT III area, considerably faster over the past several years. More improvements are planned (see Alpine Skiing in Chapter 4), which would eliminate other bottlenecks and expedite access.

The adequacy of egress from the CAT III area is best indicated by egress from the base of China Bowl where Lift 21 currently provides the only means. This would be problematic if additional skiers in the CAT III area were added to those using the Back Bowls and depending solely on Lift 21 for egress.

In terms of other support services, skiers in the Back Bowls currently use the same facilities as those on the rest of the mountain, with the addition of food service at the bottom of Lift 21. Two Elk Restaurant and Camp 1 probably serve more Back Bowl skiers than other facilities, but Summit, Wildwood, and Mid-Vail are also popular. All these facilities are accessible to Back Bowls skiers but, with the exception of the facility at the bottom of Lift 21, would be somewhat less so to the CAT III area skiers, particularly in light of the limited egress via Lift 21.

3.4.3.2.9 Skier Safety and Management

This section provides background information for assessing potential impacts in the areas of snow avalanche and out-of-area skiing.

3.4.3.2.9.1 Avalanche

Avalanche control is an important operational consideration at ski areas. Standard control measures employed by the snow safety specialists and ski patrol include avalanche forecasting, ski cutting, use of explosives, and normal skier compaction. In preparation for the potential development of the CAT III area, avalanche studies have been conducted over the past four winter seasons (VA 1995). Figure 3.10 shows the avalanche areas of concern. Table 3.14 lists CAT III areas with potential avalanche hazards and identifies control measures appropriate to each.

3.4.3.2.9.2 Out-of-Area Skiing

During public scoping, concern was expressed that the development of the CAT III area might create attractive opportunities for skiers to leave the managed ski-area boundary and potentially expose themselves to hazards common in the backcountry. Concern was also voiced that out-of-area skiers bound for Red Cliff and Minturn might create parking problems in these communities, which are approximately 6.5 and 4.1 miles, respectively, from the summit of Vail Mountain. In neither case would the ski experience be particularly attractive, since both routes would involve a considerable amount of relatively flat terrain. Routes to Red Cliff would also pass through low-elevation terrain with many southern exposures, which would normally not provide good skiing conditions. Any route to Minturn would be confined to the bottom of Two Elk Creek and be unattractive to downhill skiers. This route is currently accessible to skiers from the Back Bowls, but it is not used frequently.

A Boundary Management Plan is required under the Vail Ski Area's SUP. The plan details how the ski area boundary will be managed, including placement of gates at points of access into the backcountry. This plan is reviewed annually and updated as necessary. Frequently, as a new area is developed, patterns of out-of-area skiing develop which are difficult to forecast. It is Forest Service policy to generally allow entry into the backcountry via ski lifts, but to inform individuals about hazards inherent in uncontrolled conditions outside of ski area boundaries. Under certain, very limited conditions, the Forest Service can administratively close areas in order to prevent exposure to areas of inordinate risk.

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Figure 3.10. Avalanche areas in the PA.

Currently, one of the most popular locations for out-of-area skiing is the East Vail Chutes, beginning near the summit of Siberia Bowl and dropping to I-70 east of the TOV. During scoping, it was asked whether development of the CAT III area would offer additional access to this area. The CAT III area does not adjoin or provide access to the East Vail Chutes.

Table 3.14. The CAT III area avalanche hazards

Path	Bowl	Hazard	Recommended Control
A	Commando	Low, Intermittent	Recommend explosives, can ski cut with two teams
B	Commando	Low	Ski cutting only
C	Commando	Moderate	Recommend explosives due to length of trail
D	East Pete's	Moderate, Intermittent	Ski cutting, use explosives during extreme conditions
E	East Pete's	Moderate, Intermittent	Ski cutting, use explosives during extreme conditions
F	Pete's	Moderate, Intermittent	Ski cutting, use explosives during extreme conditions
G	Pete's	Moderate, Intermittent	Explosives and ski cutting
H	Pete's	High, Intermittent	Explosives hung from cornice with ski kicking
I	Pete's	High, Intermittent	Explosives hung from cornice with ski kicking
J	Super	Low	Ski cutting, use explosives during extreme conditions
K	Super	Low	Ski cutting only
L	Super	Moderate, Intermittent	Ski cutting, use explosives during extreme conditions
M	Super	Moderate, Intermittent	Explosives and ski cutting
N	Super	Low	Ski cutting only

3.4.4 SOCIOECONOMICS

Off-mountain, growth-related impacts are the focus of the socioeconomic analysis. Three steps were taken to define the scope of this component and thereby determine which features of the socioeconomic environment should be described here to establish the baseline for this analysis. First, the aspects of the Proposed Action and alternatives which could trigger socioeconomic impacts were identified. Next, socioeconomic issues identified during scoping associated with these aspects were enumerated and grouped in a logical manner. Finally, the geographic level at which each issue or group of related issues could be most realistically addressed was determined. With this framework in place, appropriate analytical methods were undertaken to target socioeconomic issues in an efficient, straightforward way.

Regarding triggers for potential impacts, two aspects of the Proposed Action and alternatives were identified: potentially increased numbers of off-peak skiers and expanded VA staff associated with the proposed improvements. All potential direct, indirect and cumulative socioeconomic impacts addressed in Chapter 4 stem from these two factors.

Two key assumptions were made in limiting the analysis to these two triggers. First, no increase in peak-day skier numbers or the number of peak days per season is anticipated. VA may increase off-peak visitation, but their approved manage-to SAOT capacity of 19,900 will remain in place, as stipulated in their Forest Service SUP and Master Development Plan. The Agreement (TOV/VA 1995) outlines measures to maintain this limit and is summarized in Appendix A. Second, many pertinent aspects of the community's current infrastructure have been developed on the basis of the long-standing 19,900 manage-to figure and are underutilized during off-peak periods. The 19,900 SAOT figure was formally evaluated in the 1986 EA and was approached in the 1988 season. Thus, variables such as bed base, restaurant capacity, and employment in the skier service and retailing sectors are not at issue.

Traffic and parking have long been recognized as the major peak-day problems in the TOV. They are the major off-mountain impacts addressed in detail in the Agreement between the TOV and VA and summarized in this Draft EIS as Appendix A. In light of their importance and unique technical aspects, these issues are dealt with in the following Transportation section.

The process of identifying off-mountain, growth-related issues other than traffic and parking associated with increases in off-peak skier numbers and ski-area employees involved internal review of the Proposed Action and alternatives by the EIS team, supplemented by public and agency scoping. The issues are:

- ◆ Employee housing;
- ◆ Community services, including municipal water supply, wastewater treatment, solid waste disposal, schools, and police, fire and emergency medical services;
- ◆ Economic considerations, particularly public costs and tax revenues;
- ◆ Lifestyles and quality of life in the Upper Eagle Valley; and
- ◆ Level of use of National Forest recreational resources at the Vail Ski Area.

The last issue involves the broadest geographic scope; skiers from all over the U.S. and abroad take advantage of the ski area's recreational opportunities. On the other hand, assessment of affordable employee housing and the quality of life in the Upper Eagle Valley requires a tighter geographic focus, from the outer limits of the Vail area's commuting range to the TOV itself. Community services and economic considerations are more localized still, addressed to some degree within the commuters' range, but primarily involve the immediate vicinity of the TOV.

Growth and development needs in the region have been well studied over the last decade. Comprehensive background information on these and other issues is presented in many documents, including those listed below.

- ◆ Decision Notice and Finding of No Significant Impact, Amendment to the Vail Ski Area Winter Sports Site Master Development Plan to Include and Allow the Development of the Vail Ski Area Winter Sports Site, Eagle County, Colorado (USDA-FS 1986a).
- ◆ Environmental Assessment - The Vail Ski Area Expansion (USDA-FS 1986b).
- ◆ Potential Impacts of the Vail Ski Area Master Plan Regarding Circulation, Parking, and Population Growth on the Town of Vail (RRC 1985).

- ◆ The Eagle County Housing Needs Assessment (RRC 1990a).
- ◆ The Vail Area Housing Needs Assessment (RRC 1990b).
- ◆ Eagle County Master Plan: A Bridge to the Future (Richman 1994).
- ◆ Water System Master Plan for the Vail Valley Consolidated Water District (Merrick & Company 1994).

These are the primary documents consulted for this analysis. Interviews with appropriate officials provided additional detail and context. Under the following headings, summary overviews and key aspects relevant to this analysis are presented for the issues of concern identified above.

3.4.4.1 Employee Housing

As in most rapidly developing resort communities in Colorado and elsewhere, affordable housing for workers has become a problem and is now widely recognized as a critical issue. Affordable housing was not identified as a key issue in the 1986 EA because there was a surplus of available units, but this situation has since reversed. Several factors underlie the current situation.

The most obvious factor is rapid population growth over recent years; census figures indicate growth rates of 69 and 60 percent, respectively, for incorporated (Avon, Basalt, Eagle, Gypsum, Red Cliff, Minturn and the TOV) and unincorporated areas of Eagle County from 1980 to 1990 (Richman 1994). The county master plan projects a census-population increase of 32 percent, to 29,000, by the year 2000. The TOV anticipates 16 percent growth in average winter population, including both visitors and residents, over the same period (TOV 1994a). Growth of the county's labor force roughly parallels that of the general population, and the lower-paid retail and service sectors now comprise nearly 75 percent of the workforce (Eagle County 1994).

Another contributing factor is the growing proportion of residential units which remain vacant for significant parts of the year, either as second homes or short-term tourist rentals. The county's master plan (Richman 1994) indicates that 54 percent and 30 percent of the housing inventory in incorporated and unincorporated areas, respectively, fell into this category in 1990. This situation is even more pronounced within the TOV, with 74 percent of the housing inventory in second home or short-term rental status in 1994.

Less-obvious contributors to the employee housing problem are: 1) evolution of an older, more stable workforce with different housing needs; 2) increased summer activity leading to a growing year-round workforce; 3) conversion of long-term housing units to short-term rental units for visitors, with corresponding rent increases for the remaining inventory of residential units; 4) increased construction activities which have added a growing construction component to the labor force; and 5) 1986 tax law changes affecting second-home and investment real estate (RRC 1990a).

Land availability and open-space considerations in Vail are another factor. It is estimated that the TOV is over 90 percent built out under current zoning, so the few land-use decisions left to be made are critical. While construction is booming throughout the Vail Valley, most permits issued are for housing beyond the means of the local working population and for commercial development. RRC (1990a) estimated that 1,300 to 1,640 new affordable units were needed in Eagle County to adequately house the workforce in place in 1990 and projected demand for 800 additional units by 1992.

The net result is a workforce which is increasingly dissatisfied with the housing situation and which spends an inordinate share of income on housing. Seasonal crowding in Vail area temporary rental units is common. Workers turn down employment in the area because of the difficulty of finding adequate housing, and employers have difficulty filling some positions as a result.

These problems have contributed to an incremental, down-valley movement of the labor force as the Vail area workers move as far as Eagle, Leadville, and even Glenwood Springs to find affordable housing. Negative effects in the outlying communities include escalated housing prices, displacement of lower-income people, insufficient child-care options, and stress on services in communities which do not derive the tax revenues generated by the ski resort economy in Vail.

Local governments have become increasingly active in developing strategies to overcome the shortage of affordable employee housing. As noted above, both Eagle County and the TOV have conducted housing needs assessments (RRC 1990a; 1990b), primarily to more accurately define the employee housing problem and identify ways to come to grips with it. Local governments recognize the problem as regional rather than local. The data compiled in the Eagle County study were combined with information from other sources as a basis for strategic planning in the TOV study. Eagle County used its housing study in compiling the policies and action plans regarding affordable housing presented in the Eagle County Master Plan (Richman 1994). Both the TOV study and the county master plan are comprehensive in laying out their respective approaches to developing adequate, affordable employee housing. The details are beyond the scope of this analysis. The focus in this document is on how effective it has been.

VA has been active in addressing the employee housing issue, primarily by providing subsidized employee housing in VA-owned or -managed units. VA has been involved in various ways in the development and/or management of Timber Ridge, The Tarnes, Sunbird Lodge, Eagle Bend and Lake Creek. The number of employee beds provided grew from 169 in 1986 to 452 in 1992, 529 in 1993, and 641 in 1994. VA also offers a second mortgage program to reduce down payments for employees purchasing first homes. (Flynn, *pers. comm.*, 1995.) The Agreement briefly addresses employee housing issues and reconfirms the commitment of the signatories to working together to resolve them. The Vail Commons project is cited directly.

In 1990, the main affordable/employee housing developments in the Vail region were Timber Ridge in Vail and The Tarnes in Beaver Creek. These comprised about 225 units, over half of which were controlled by VA or other major employers. These units were part of the baseline against which excess demand was assessed in the 1990 study (RRC 1990a).

Since then, a number of developments have been completed in the Vail region, including: Sunbird Lodge (Vail, 54 units, converted from hotel to employee housing by VA in 1990), Eagle Bend (Avon, 240 units with 54 more under construction), Lake Creek Apartments (near Edwards, 270 units), River Run (Eagle-Vail, 117 units, converted to market rental program in 1994), and Eagle Villas (Eagle, 120 units). In addition to these multi-unit developments, 50 to 60 new caretaker units and other small, single units have been completed since recent changes were made in Vail's zoning density regulations (Silverthorn, *pers. comm.*, 1995).

About 300 of these new units had been added to the region's inventory by 1993, when a deficit of 2,500 affordable units was calculated (Richman 1994), of which 860 were for year-round residents. About 570 units have been built from 1993 to present. In addition to the 54 new Eagle Bend units to be completed this year, the Vail Commons project is slated to provide 60 new affordable units if approved, and Eagle Villas Phase 2 should add 10 town homes to that development.

These figures suggest an on-going deficit in affordable housing, but this conclusion is tempered by the fact that several developments, including Lake Creek Apartments and Eagle Villas, have had some difficulty filling. The perception among some officials and property managers is that the demand projections were unrealistically high, that higher demand exists for detached, single-family dwellings, and that there is a mismatch between the types of people in need of affordable housing and the qualification standards for some of the new developments. These factors make real demand difficult to quantify, but apparently a deficit remains, and multi-unit rental developments may not be the most effective way to address it. (Flynn, *pers. comm.*, 1995.)

In the view of VA's management, the roughly 4,000 VA employees fall into three categories, full-time staff, seasonals who work for VA year after year, and transient seasonals. For the first two groups, housing is not a pressing concern as they generally have established residences in the region. The third group is more problematic. Numbering about 1,000, they occupy most of the employee beds noted above. VA's objective is to make more long-term arrangements to house these employees rather than negotiating year-to-year accommodations. (Flynn, *pers. comm.*, 1995.)

3.4.4.2 Community Services

3.4.4.2.1 Municipal Water Supply

The Vail Valley Consolidated Water District (VVCWD) provides municipal water to the area from East to West Vail. The Upper Eagle River Water Authority (UERWA) serves the communities of Eagle-Vail, Avon, Beaver Creek, Arrowhead, Edwards and Berry Creek. Both of these water districts are managed by the Upper Eagle Valley Consolidated Sanitation District (UEVCSD), which also manages wastewater treatment in the combined area of the water districts, as described under the following heading. Developing and maintaining adequate water supplies in the two districts has been the focus of intensive master planning and capital development in the last several years. The following information is drawn from Merrick & Company (1994) and Galvin (*pers. comm.*, 1995).

Both districts have more than adequate water rights; the UERWA holds rights to 22 million gallons per day (gpd), and current peak demand is 6 million gpd. In regard to actual production, the VVCWD recently completed modifications to the old East Vail water treatment plant and brought it on line, adding 0.6 to 1 million gpd of production capacity. In addition, a new well in the golf course area was developed with a 3-million-gpd production capacity. This capacity is currently not needed, but was developed as a backup for primary systems.

Down valley, the UERWA's current 5.4-million-gpd production capacity is considered marginal. Planned improvements to the Avon treatment plant would increase total production to 6.4 million. Additionally, an interconnect system linking the VVCWD and UERWA systems is currently being completed which would allow 1.5 million gpd to be transferred down valley to the UERWA, and 1 million up valley to the VVCWD. This option will make about 8 million gpd available in the near future. A project to increase production of the Avon plant to 10 million gpd is out for bid. This increase will meet demand for the next 8 to 10 years.

The remaining concern regarding municipal water in the region is maintenance of instream flows, in Gore Creek for the VVCWD and in the Eagle River for the UERWA. Deficits between the Vail Golf Course and the Forest Road treatment plants are of particular concern. The interconnect will largely eliminate this problem, as low-flow periods in one area correspond with high-availability periods in the other. September/October and December/January are the periods of concern for Gore Creek, while peak demand down valley is in summer, and the 1-million-gpd transfer up valley is readily accommodated. Conversely, during summer Gore Creek's runoff flows allow the 1-million-gpd transfer down valley when irrigation demand is highest.

The Eagle Park Reservoir Project is a joint initiative under which Eagle County, VA and others are acquiring 1,100 acre-feet of water annually from a Climax Mine pond to enhance flows in the Eagle River. Of this, 500 acre-feet is under contract and an option is held on the remaining 600 acre-feet. This water could be available for municipal use or snowmaking and would serve to maintain instream flows.

In summary, potential problems regarding municipal water supplies in the Vail region have been identified and quantified, and planning and capital investment have been undertaken to meet the region's projected needs until buildout well into the next century under any possible growth scenario.

3.4.4.2.2 Wastewater Treatment

The wastewater treatment situation parallels that outlined above for municipal water supply. Potential constraints have been identified and addressed through comprehensive planning and capital improvements. The upstream plant at Vail nears capacity during runoff, primarily because of infiltration of water into collector lines. A program of patching and replacement is expected to resolve this problem. Additionally, there is a provision for the Avon and/or Squaw Creek plants to handle the TOV wastewater treatment should the need arise. The Vail plant and system should meet Vail's needs through buildout without further modification.

The area from West Vail to Avon is served by the Avon plant, which will be expanded by late 1996. Wastewater from Avon and communities to the west is treated at the Squaw Creek plant. Some minor improvements to this facility will be completed this year. Cumulatively, these improvements are expected to accommodate the 29,680 Single Family Equivalents (SFEs) anticipated at buildout in the UEVCSD service area, and will meet projected demand through 2012. SFEs are a standard unit of measure used in calculating wastewater treatment capacities.

3.4.4.2.3 Solid Waste Disposal

The county master plan describes the Eagle County landfill developed in 1990 north of Wolcott, which is the only permitted solid-waste disposal facility in the county and the focus of this analysis. Its capacity is 1.8 million cubic yards of refuse. The projected life span of the facility was recently reduced from 25 years to 10 to 15 years in light of more rapid population growth and less capacity than originally estimated. Expansion opportunities in the area of the existing facility are being investigated, and the county plan calls for evaluation of landfill fees, efforts to increase recycling, and reuse of construction debris to address the problem of solid waste disposal (Richman 1994).

In regard to recycling, the county plan describes the operation of the We Recycle group which, with county, TOV and Avon subsidies, organizes recycling efforts in the county. The program handled an increasing volume of aluminum, plastic, steel, newspaper and glass until 1993, when the limitations posed by the capacity of We Recycle's collection system and storage and processing facility stopped further growth at about 1,600 tons. The plan outlines efforts to overcome these constraints through capital facility improvements and to become more active in promoting recycling.

In summary, potential problems regarding municipal water supplies in the Vail region have been identified and quantified, and planning and capital investment have been undertaken to meet the region's projected needs until buildout well into the next century under any possible growth scenario.

3.4.4.2.4 Schools

The Eagle River School District encompasses nine schools most likely to be affected by a VA staffing increase. Enrollment in these schools increased by 65 percent from 1982 to 1993, and 5,100 new students, another 65-percent increase, are anticipated by 2002. Elementary schools in Gypsum and Edwards were built—and high schools in Eagle-Vail and Gypsum were expanded—in 1991 to accommodate rapid growth in enrollment. (Richman 1994.) The student:teacher ratio for the district is a favorable 23:1, and the \$18.6-million 1993 budget equated to \$6,000 per student.

The county master plan indicates a total excess capacity of 18 percent over 1992/93 enrollment. It goes on to outline proposed expansion and new construction of district schools, particularly in the middle valley. These improvements to the system include:

- ◆ A new 450-student elementary school at Avon, open for the 1996/97 school year.
- ◆ A new, 450-student middle school in Edwards, with 6-room expansion capacity, also open for the 1996/97 school year.
- ◆ A 100-student expansion to the Eagle Middle School, in service in November 1995.
- ◆ A planned classroom addition to Battle Mountain High School in Eagle-Vail.
- ◆ Possible classroom additions to the Gypsum Elementary School in the next 2 to 3 years.
- ◆ Addition of various auditorium, music and sports facilities at the Eagle Valley Campus, Battle Mountain High School, and Eagle Valley High School in Gypsum.

These improvements to the school system should meet projected demand through 2005. (Enright, *pers. comm.*, 1995.)

3.4.4.2.5 Police, Fire and Emergency Medical Services

Law enforcement in the area is provided primarily by police departments in Vail (18 patrol officers), Minturn (5 positions) and Avon (9 positions). The Eagle County Sheriff's Department serves unincorporated areas of the county, including Vail Mountain and communities such as Red Cliff. The Colorado State Patrol, dispatched from Eagle, shares responsibility for highways. The Vail Police Department is currently adequately staffed, though a manpower analysis currently underway may alter this conclusion (Layman, *pers. comm.*, 1995). The greatest strain comes when inclement weather causes accidents and associated traffic problems on I-70, and the Vail police, fire and ambulance personnel respond because of their proximity. When this occurs, the capability to respond to needs in Vail is reduced (Silverthorn, *pers. comm.*, 1995).

Peak days during the ski season are not viewed as a major law enforcement problem. In fact, summer crowds are typically more unruly. Staffing and schedules are arranged in advance to provide adequate coverage during busy periods, but this may mean that less-than-optimum staffing is available at other times. Filling positions is difficult because of the high cost of living relative to the town's funding of the department. (Layman, *pers. comm.*, 1995.)

Fire protection in the Vail area is provided by the Vail Fire Department, which maintains stations in Vail and East Vail. Sixteen paid firefighters are supplemented by 12 volunteers from Colorado Mountain College's Fire Science Program. With four pumper trucks, two ladder trucks, two utility vehicles and a hazardous materials trailer, the department responds, in order of frequency, to accidents on I-70, to accidents and medical emergencies in the Vail area, and to fire alarms. The number of actual fires is small, but the other duties keep the department stretched thin, particularly because of the large area of coverage. Plans under review by the town call for construction of a third station in West Vail, which would significantly enhance the department's services. (Benson, *pers. comm.*, 1995.)

Fire protection and some emergency medical services in the area from Eagle-Vail to Wolcott are provided under contract by the Avon Fire Department. This department has 12 paid staff members, several interns, and a traditional volunteer force, totaling 70 individuals. Stations in Avon, Beaver Creek and Edwards are staffed with two firefighters full time, while facilities in Eagle-Vail and Avon's Wildridge subdivision are staffed on demand. Consolidation to three stations in Eagle-Vail, Avon and Beaver Creek is under discussion. The department operates one ladder truck, five large-capacity pumpers, three small-capacity pumpers, and several utility vehicles.

Calls have increased by over 50 percent since 1987, when the paid staff was cut back from 16 to 12. They continue to grow by 7 to 8 percent per year. The Fire Chief rates their capability to respond to structural fires as good, to wild fires as fair. (Moore, *pers. comm.*, 1995.)

Minturn has a volunteer fire department with a paid chief. Their newest truck is 25 years old, but they hope to get a newer truck from the Avon department. They cooperate effectively with their Avon counterparts, but their capacity is limited. (Moore, *pers. comm.*, 1995.)

Eagle County Ambulance District recently shifted its headquarters from Vail to Edwards in response to the down-valley population growth. Ambulances and full-time crews are now maintained at Vail Valley Medical Center and at Edwards. The center also offers a full range of routine medical services. A branch of the medical center planned at Edwards is at the sketch-plan stage. There is already a medical center at Beaver Creek that meets emergency needs in the resort area. In combination with the fire department EMTs, these facilities provide excellent emergency medical care in the Vail region. (Benson, *pers. comm.*, 1995; Layman, *pers. comm.*, 1995; Silverthorn, *pers. comm.*, 1995.)

3.4.4.3 Economic Considerations

The economic contribution of ski areas in Colorado is well documented. Resorts operating on federal lands generated approximately \$3.2 billion in total economic activity and provided about 86,000 full-time-equivalent jobs during the 1994/95 ski season (USDA-FS 1995d). With Vail and Beaver Creek ski areas combining to comprise 18 percent of Colorado's skier visits during the 1994/95 season, such impacts are clearly important at the local level. The Vail Ski Area alone accounts for about 14 percent of state skier visits.

The Vail region's economy is clearly driven by recreational visitation, but such visitation has taken increasingly varied forms. While the destination skiers staying in rental units at Vail Village are still the dominant factor, they have come to share the scene with more regional day skiers and skiers with second homes in the region. Summer visitors to the area are increasingly drawn by dispersed recreation, organized musical and sporting events, conference facilities, or simply the beauty of the surroundings.

However, skiing is still the community's major draw, as indicated by the fact that about 60 percent of the TOV's sales-tax receipts are generated during the four-month prime ski season from December through March. TOV

sales taxes during this period in 1994 totaled nearly \$8 million. Destination skiers are major contributors in this regard. Tax revenues of this magnitude allow the TOV to routinely maintain a high level of public services, though periodic, major capital expenses can pose funding problems. Recent trends in skier and tourist visitation and spending have tempered this situation somewhat. Sales tax revenues have not increased at the higher rates previously experienced, but the costs of providing services have continued to rise. As a result, some TOV programs, including public transit, may face cutbacks. (Silverthorn, *pers. comm.*, 1995.)

At the county level, rapid growth in population and economic activity has translated to revenue surpluses in recent years. However, Amendment One limits revenue increases, forcing the county to return surplus revenues to their sources. A referendum to “de-Bruce” Eagle County is underway. If voters support the move, the county will be able to retain surpluses and secure other funds such as state grants.

In addition to serving as the community’s major economic drawing card, the ski area contributes directly to local government revenues. Through the Agreement, VA contributes 4 percent of its annual ticket-sales revenues to help fund the area’s public transportation system. Further, as part of the Agreement (TOV/VA 1995), VA has paid \$500,000 for construction of roundabout circles replacing the four-way stop in Vail Village. Through these and various other arrangements, VA has helped fund a number of key initiatives to develop and maintain community infrastructure.

VA also generates federal revenues through the Graduated Fee System (GFS) associated with the ski area’s SUP. These fees are assessed on the basis of skier numbers and ski area revenues. Fee payments go directly to the Federal Treasury, but 25 percent of these payments can be returned to the counties where they are generated through the Payment In Lieu of Taxes Program. VA paid over \$2.4 million in GFS fees for 1994/95.

In the Vail area, these skier-generated revenues have allowed local governments to maintain a high level of public services, as indicated under the previous headings. This scenario changes, however, in the outlying communities such as Gypsum, Eagle and Leadville where many Vail-area employees reside. While population growth in Vail averaged only 1.2 percent from 1990 through 1993, the rate reached 8.8 percent in Avon, 6.8 percent in the County’s unincorporated areas, and 3.3 percent in Gypsum (Dept. of Local Affairs 1995). Much of this growth is associated with economic expansion in the Vail area, resulting in these outlying areas functioning as bedroom communities. These communities generally realize less income from skiers but absorb the costs of providing services to a rapidly expanding, lower income workforce.

3.4.4.4 Lifestyles and Quality of Life

During scoping concerns were expressed about how the development of the CAT III area might affect the quality of life of Upper Eagle Valley residents. Most of these concerns are subjective and difficult to assess. Many of the same challenges face resort communities throughout Colorado and are not unique to the Vail area. They include:

- ◆ Maintaining a rural or at least non-urban living environment.
- ◆ Preserving a wide array of outdoor recreational activities and opportunities.
- ◆ Managing peak-day demands to avoid over-taxing the community infrastructure.
- ◆ Providing a variety of social and cultural programs and activities.
- ◆ Maintaining a sense of community and cultural values in the face of rapid development and changing employment and economic opportunities.
- ◆ Offering high-quality educational programs.
- ◆ Providing relatively crime-free neighborhoods.

Many of these issues are symptomatic of areas which, like Vail, are undergoing rapid growth. While development of the CAT III area may ultimately add incrementally to overall growth, it would be difficult to isolate its effects.

In Vail, as in most resort communities, quality of life means different things to different people, each of whom counts both costs and benefits in visiting, working or residing there. For the permanent, year-round residents, the most enjoyable time might be the quiet spring and fall shoulder seasons, when both part-time resident and tourist numbers are lowest. Part-time residents who come to ski may prefer off-peak periods to the major holiday weekends when nonresident skiers crowd the slopes and the village. Golfers may enjoy summers and shun winters completely. It is safe to say that the community, and the high quality of life it offers, hold a strong appeal to the diverse groups who choose to reside or visit there. It is also safe to say that the worst days in terms of quality of life occur when too many of these groups converge at once. Peak days, which occur in winter and summer, stress the system and make everything—parking, recreation, sightseeing, shopping, dining, and entertainment—less enjoyable. These peak periods are predictable and, to a degree, controllable. Much of the community's planning for development and recreation has focused on not exceeding the comfort zone in terms of crowding.

Overall, Vail has evolved to the status of a mature resort community. Aside from virtually total social and economic dependence on recreation, a key aspect of a mature resort community is recognition of problems threatening the quality of life, active planning to overcome them, and attaining the financial resources to do so. The limited scope of this analysis indicates that the few key problems are recognized. The size of the planning staffs employed at various levels, the scope and volume of planning initiatives underway, and the number of planning documents produced of late show the high level of focused planning activity. The brief economic summary above suggests there are adequate financial resources to effectively implement most plans.

However, the situation in communities outside the immediate Vail area is somewhat different. Some residents of older, established communities such as Minturn, Red Cliff, Leadville, Gypsum and Eagle typically do not share the view of Vail residents that the resort economy, with its benefits and costs to quality of life, is desirable or should dominate the region. Some feel that their community's integrity is at risk, as is their control over their own destinies. In a more objective sense, impacts in areas such as affordable housing and community services are felt more keenly in communities without Vail's resources to deal effectively with them. On the positive side, the more stable employment base afforded by resort development undoubtedly helps maintain some of these communities.

3.4.5 TRANSPORTATION AND PARKING

Parking and transportation were two of the primary issues identified and addressed in the 1986 EA/DN (USDA-FS 1986 b,a) on the Vail Ski Area Expansion. The 19,900 SAOT manage-to capacity was derived in part from concerns about level of service and related parking problems experienced on peak days. In addition to the potential for compounding peak-day traffic and parking problems, scoping activities for this EIS disclosed three current concerns related to transportation and parking.

- ◆ How would the Proposed Action affect parking in the TOV?
- ◆ What would be the effect of the Proposed Action on traffic levels and patterns and on roads, streets, and highways?
- ◆ How would mass transit and transportation change under the Proposed Action?

The Agreement has been described and cited in several sections of the EIS. It is an important part of understanding the current transportation and parking situation in Vail, because it affirms the TOV/VA

commitment to improving transportation and parking, and prescribes specific actions to be undertaken. A summary prepared by the TOV/VA (Strategies for the Future) to introduce the Agreement to the public is provided at Appendix A. Among other provisions, it continues the "manage-to" concept from the 1986 EA, as well as the Parking Task Force for solving parking and transportation problems. This section summarizes the current transportation and parking situation in Vail under the proviso in the TOV Resolution adopting the Agreement which reads: "Category III with regard to off-site impacts has the backing and support of the Town Council". The Agreement itself further states: "Accordingly, TOV believes that the scope of the Forest Service's environmental review need not focus on the off-site issues related to the TOV since they have been previously identified, studied and discussed through the public process and since this agreement will ensure that growth management processes established herein are followed." Parts of this Agreement are cited in this section.

This section builds on the traffic and parking analysis of the 1986 EA, incorporating subsequent studies, analyses, and proposals for solving traffic and parking problems. Although the implementation of several formal mitigation measures has reduced or eliminated some impacts, the peak-day transportation problems and the desire to maintain and improve the level of service are of concern. The transportation problems can affect a visitor's perception of quality and overall satisfaction, and parking and transportation are also factors in the daily life of Vail residents and employees.

In January of 1993, Felsburg, Holt and Ullevig, prepared the Vail Transportation Master Plan for the TOV. The plan contains a number of site and situation specific recommendations for parking and transportation issues. Information from the plan was considered in the preparation of this section.

3.4.5.1. Transportation Infrastructure

This description and analysis of transportation is at two levels: the TOV, and an extended area. The TOV area is defined as the road system between the east and west Vail interchanges along I-70. This corridor includes the three I-70 interchanges (both east- and west-bound exits and entrances) and the intersections along the frontage roads that parallel I-70 (Figure 3.11).

The extended area includes I-70 from the Eisenhower Tunnel, the U.S. Highway 24 corridor from Leadville to its intersection with I-70, and I-70 west to Dotsero.

3.4.5.1.1 Interstate 70 (I-70)

I-70, with a posted speed of 65 mph is the principal transportation feature within the TOV, providing two travel lanes for both east- and west-bound vehicles. Average daily traffic counts made by Colorado Department of Transportation (1993) at the three I-70 interchanges in the TOV were reported as follows: 1) 30,600 vehicles between the West Vail and the Minturn interchange, 2) 21,600 vehicles between the west and main Vail interchanges, and 3) 17,400 vehicles between the main and East Vail interchanges (Tenney, *pers. comm.*, 1995).

I-70 divides the TOV into a north and a south section. Vail Village, Lionshead, the ski area, golf course, and most of the other tourist and recreation facilities are located on the south side of the freeway, while many private residences and other commercial locations are located on the north side. Vehicles wishing to cross from one section of town to the other must utilize the underpasses at the I-70 interchanges, merging them with I-70 and frontage road traffic at the intersections, which results in bottlenecks (Felsburg et al. 1993)

The frequent closures of I-70 due to hazardous road conditions and avalanche control are thought to have had an impact on skier visitation at the Vail Ski Area. I-70 was closed 25 times during the 1994-95 ski season.

Vail Ski Area
Category III Development
Environmental Impact Statement

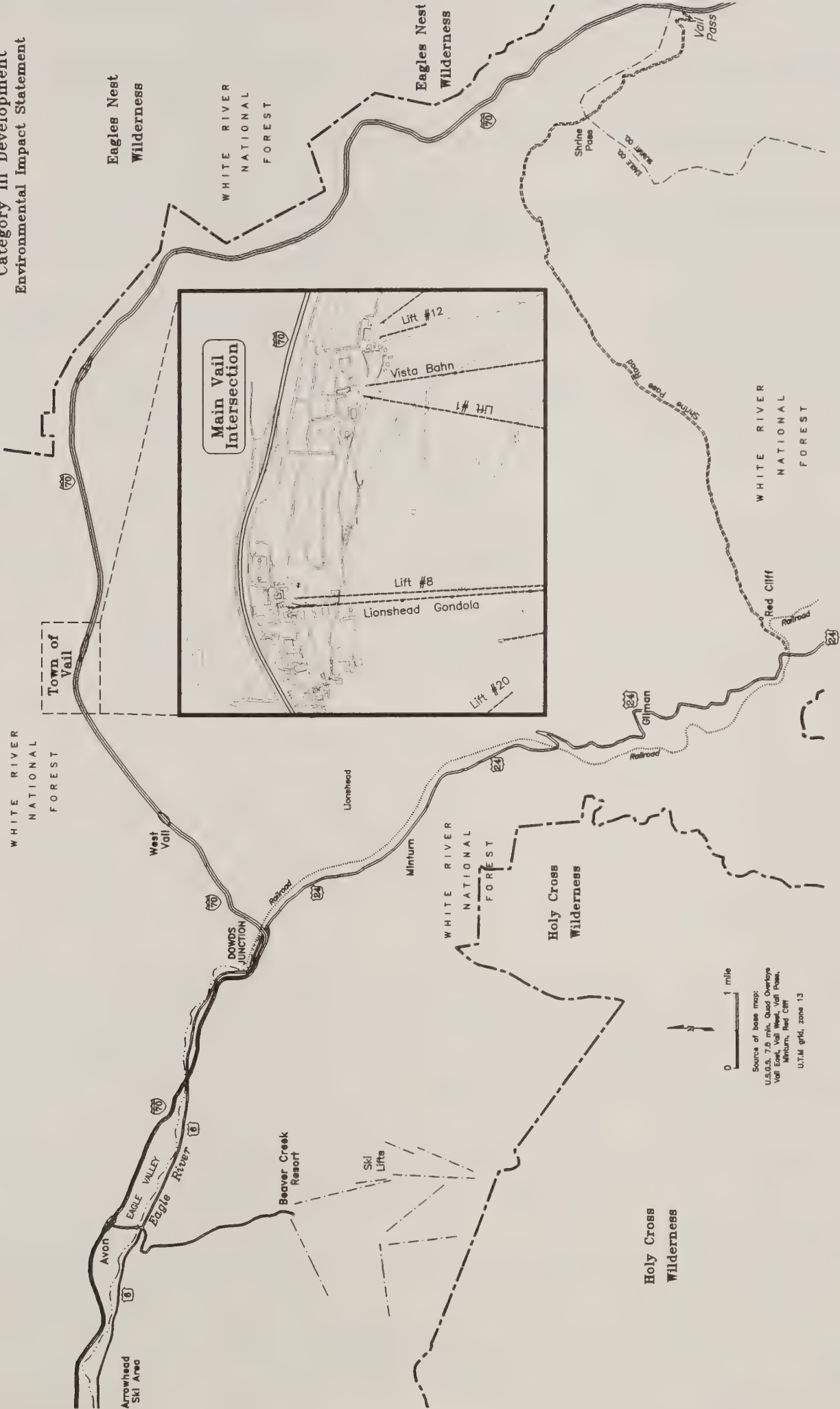


Figure 3.11. Vail area transportation corridor.

3.4.5.1.2 I-70 Interchanges

There are three I-70 Vail interchanges: main, west, and east. The main Vail interchange is at the intersection of Vail Road and South Frontage Road adjacent to the village core and ski area. This interchange and the west interchange at Chamonix Road are the primary Vail exits off I-70 and, traffic flow has been a problem during peak and high-use periods.

The highest traffic volumes at Vail occur during the winter ski and summer tourist seasons, with peaks in traffic occurring during Christmas and President's Day holidays in winter and during special events in summer. In winter, daily high-use periods occur in the morning and late afternoon, corresponding to the opening and closing of the ski lifts and the arrival and departure of the Vail area employees and day skiers. Summer tourist traffic volume occasionally exceeds winter ski traffic volumes during high profile events, although summer traffic patterns have less defined peaks and a more even distribution of traffic throughout the day (Centennial Engineering 1984).

The intersection of South Frontage Road and Vail Road (formerly a 4-way stop) was the focal point for much of the analysis, decision, and mitigation in the 1986 EA (USDA-FS 1986b). The potential capacity of this intersection is the basis of the 19,900 manage-to capacity established in the 1986 DN (USDA-FS 1986a).

In 1994, circulation and capacity at the main Vail intersection was identified by the TOV as the most important traffic issue in Vail (TOV 1994b). Historically, the Level of Service (LOS) at the main Vail interchange sometimes dropped below an acceptable LOS during peak and high-use periods, which often included morning and daily congestion corresponding to Vail area employees arriving and departing from work (Felsburg et. al. 1993). Manual control was used to regulate traffic at the main frontage road intersections during daily high demand periods, especially during peak periods, and the TOV spent more than \$70,000 each year to train and staff the manual traffic control program.

During the 1993-1994 holiday (peak) season, a voluntary traffic management plan was implemented to counter the traffic delays associated with the daily high-demand periods. Traffic from the main Vail interchange was routed to the East Vail interchange, car pooling and park-and-ride programs were encouraged, and work shifts were staggered. Although these measures reduced traffic at the main Vail intersection, traffic flow problems were then encountered at the West Vail interchange.

To resolve the LOS problem, the TOV installed a traffic roundabout at the main Vail interchange in late summer of 1995. The TOV paid approximately \$1.5 million and Vail Associates contributed \$500,000 towards construction of the roundabout, which is a type of traffic circle through which vehicles move in a counter-clockwise direction until reaching their exit road. There are no signal lights or stop signs controlling access to or egress from the roundabout and therefore, traffic moves in a constant flow around the traffic circle. According to the TOV it is projected that the roundabout will:

- ◆ increase the traffic capacity at the intersection by more than 50 percent;
- ◆ increase the number of vehicles (up to 5,000 per hour) processed through this intersection;
- ◆ reduce the average delay from 60 to 5 seconds and improve the LOS to level A; and
- ◆ decrease the number of accidents at the intersection by about 20 percent.

The West Vail interchange at Chamonix Road provides access to the West Vail lodging, service, shopping facilities, and residential areas. It is heavily utilized by visitors as well as residents. Frontage road intersections

associated with this interchange also periodically experience traffic flow problems. A second roundabout is being considered for the West Vail interchange. Its construction is currently unfunded and may depend upon the success of the first roundabout.

The East Vail interchange is located at Bighorn Road about 4 miles east of the main interchange. This exit is used by some day skiers, but has not been historically congested because it accesses a residential area which lacks parking for skiing or other recreational activities (Felsburg et al. 1993).

3.4.5.1.3 Frontage Roads

The frontage road system is important for vehicle circulation within the TOV. Generally both the of the frontage roads consist of two 12-foot-wide travel lanes. It parallels the freeway on both the north and south between the west and main Vail interchanges, then continues east on the south side of the freeway, crossing to the north side of I-70 within a few miles. Beyond the main village core, the frontage road is a primary corridor for the local transit system, which extends into both East and West Vail. Because Gore Valley is very narrow, the frontage roads are generally located within the I-70 right-of-way corridor.

The TOV has employed many measures for easing the traffic problems along both frontage roads. These included: 1) widening it between the main Vail interchange and the Vail parking structure to accommodate dedicated turn lanes, 2) periodic restrictions on routine traffic going into the village core, emphasizing pedestrian options, 3) sponsoring a free bus shuttle system to transport people in and around the village, and 4) a variety of voluntary employer-supported measures to encourage car pooling and use of the area bus system. The Agreement between the TOV and VA has formalized some of these actions as management measures.

3.4.5.1.4 U.S. Highway 24

U.S. Highway 24, intersecting I-70 five miles west of the TOV, carries a significant amount of employee traffic each day into the Vail Valley. CDOT 1993 traffic counts estimate that between the Town of Minturn and I-70, average annual daily traffic volume is 7,600 vehicles. Beyond the Town of Minturn, traffic volume decreases (Tenney, *pers. comm.*, 1995). Traffic volume from U.S. Highway 24 indirectly contributes to the daily high-demand periods that coincide with morning and evening employee travel in the TOV.

3.4.5.1.5 The Vail Village Core

The TOV's central core was originally designed as a pedestrian-oriented village and general vehicular traffic is restricted. This area is served by a free in-town shuttle bus service which takes people from parking areas outside the village into the high-density, commercial lodging and retail core. High volumes of delivery and service vehicle traffic has infrequently resulted in conflicts between pedestrians and delivery vehicles. Inadequate service and delivery facilities, including a lack of service alleys, necessitate many deliveries being made to front door access points. Winter delivery traffic volumes are approximately 13 percent higher than summer volumes. (Felsburg et al. 1993). Currently, delivery vehicle traffic is restricted by a permit system under which delivery vehicles must obtain a permit in advance for a specific time and location if they wish to enter the vehicle-restricted zone in the central core. Delivery times are scheduled for the early morning or at night when there are fewer pedestrians.

The restriction on vehicles in the village has been effective in curtailing even greater problems that might otherwise be associated with operating vehicles in a very congested space. The orientation to a pedestrian system has carried into the overall theme of the village and has become a fixture for planning and development. The Vail

Transportation Master Plan (Felsburg et al. 1993) documented several other options that could be implemented in the future.

3.4.5.2. Mass Transit

Visitors, residents, and employees arrive at Vail via automobile or mass transit. Though most travel is in private vehicles, local Vail and down-valley shuttle systems have become increasingly effective and important transportation factors. Private intra-resort van shuttle service increases during the ski season. Several hotels and private transportation companies run airport shuttles between the Vail area and Eagle County Regional Airport or Denver International Airport.

3.4.5.2.1 The TOV Bus System

The 1986 EA noted that the TOV bus system was heavily taxed during peak periods, especially on the in-town shuttle route (RRC 1985). Since 1985, buses have been added to the system and schedules and stops have been adjusted. The current and projected situation with respect to the TOV bus system is described below.

The TOV operates six free bus routes, including one Village shuttle route and five routes connecting with East Vail, the Golf Course, West Vail north of I-70, West Vail south of I-70, and the Sandstone areas, respectively (Figure 3.12). The Village Transportation Center serves as the hub of the public transit system, allowing riders to transfer between the outlying, in-town, and down-valley bus lines. People arriving at Vail can park their vehicles in the parking structure near the transportation center and then use the village shuttle route system to move within Vail. (Felsburg et al. 1993). Bus service is most frequent during the winter ski season and is reduced during the summer and off seasons.

The 1.7-mile loop between the Golden Peak and west Lion's Head Circle received about 75 percent of the annual total rider volume 1994. Up to 30,000 people use the bus system to travel between the slopes, lodging, shops, restaurants and other tourist attractions on peak winter days. Residents and employees also use the in-town bus route for transportation between the parking structures and the town center (Felsburg et al. 1993).

The village shuttle route operates 19½ hours a day between the hours of 6:30 a.m. and 2:00 a.m. Frequency of service is usually 8 minutes or less. Currently, eight to nine buses are used on the route, but from 3:30 p.m. to 5:30 p.m., when the demand is highest, up to four buses may be added. Efficiency, however, often decreases at those levels of service as buses become backed up at bus stops, and average bus speed slows to three or four mph. During the 1989-1990 ski season, boarding counts indicated that the in-town shuttle system was overtaxed 27 to 30 days. This could increase significantly with relatively small increases in skier visitation (Felsburg et al. 1993).

In 1996, the TOV plans to improve the service on this route by replacing some buses with 40-foot long, low-floor buses, thereby increasing passenger capacity by 40 to 50 percent. Load and unload times should decrease because riders will carry their skis onto the bus. This is expected to reduce the number of required buses during average rider days from eight or nine down to three or four.

Information on the five outlying Vail bus routes is summarized in Table 3.15. Combined 1994 ridership on the five lines was approximately 1.2 million (Rose 1995).

The TOV bus system is funded out of the town's general fund. The summary of the TOV/VA Agreement (Strategies for the Future) states, "The lift tax (4 percent) demonstrates a partnership unique in the ski industry

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#18 - Ski Lift

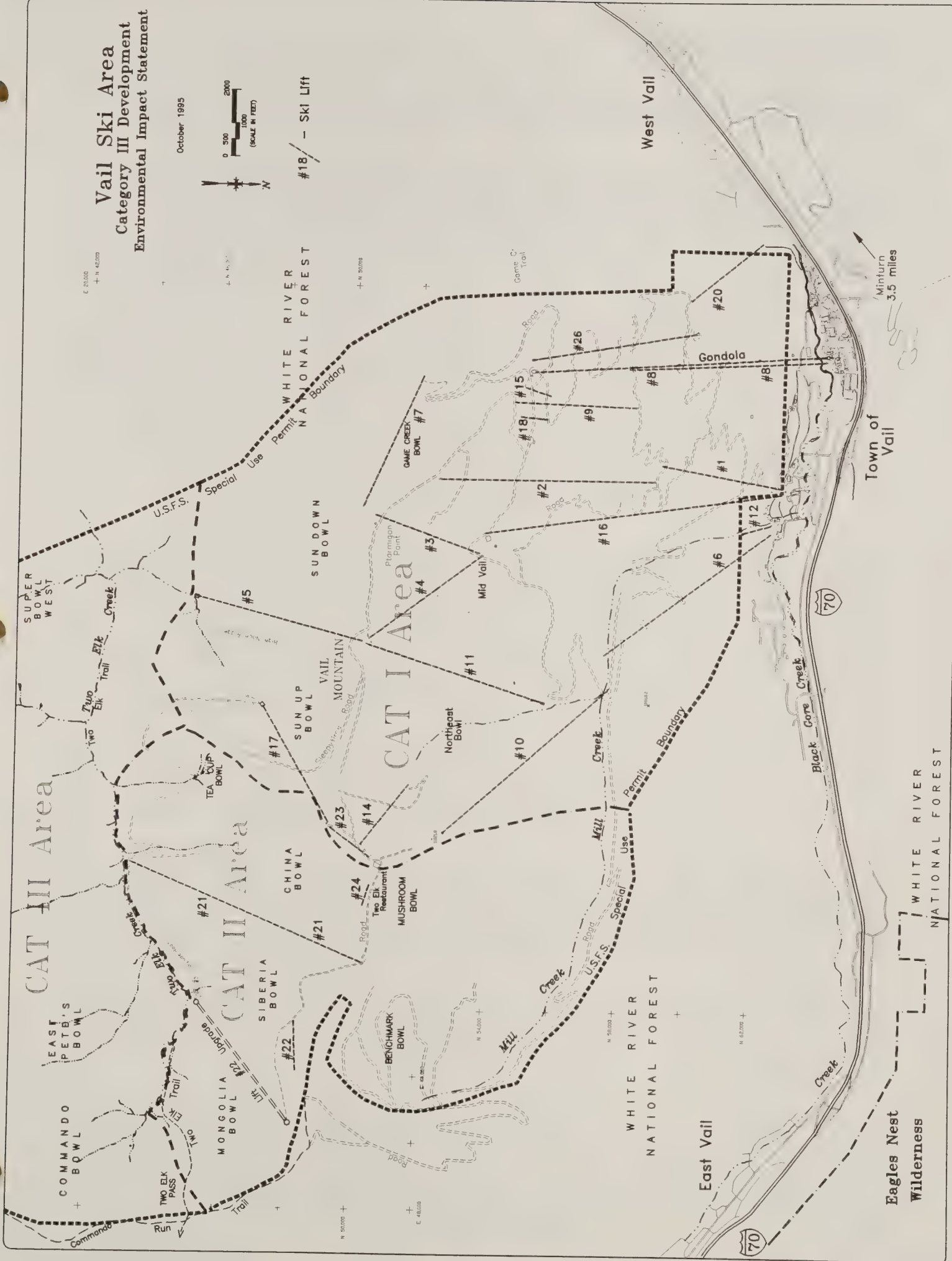


Figure 3.12. Town of Vail and Vail Mountain transportation network.

and has enabled the TOV to provide such transportation amenities as its free bus system. In 1994, lift tax revenues were approximately \$2 million." This represented about 75 percent of TOV's bus service budget.

Table 3.15. Frequency of service on outlying bus routes during peak and off-peak periods.			
	Frequency During Peak Demand Period	Frequency in Off -Peak Demand Period	Period of Operation
East Vail	10 min.	15 min.	5:45 am to 2:00 am
Sandstone	20 min.	30 min.	6:10 am to 9:10 pm
West Vail North	15 min.	30 min.	6:10 am to 2:30 am
West Vail South	20 min.	40 min.	6:10 am to 2:30 am
Golf Course/ Lionsridge	30 min.	1 hr.	6:00 am to 8:00 pm
Source: Rose 1995			

3.4.5.2.2 Regional Bus Service

The regional (intercity) bus system is operated under contract by the town of Avon and serves communities in Eagle and Lake counties. It is comprised of the three routes: 1) the Leadville route; 2) the Highway 6 route; and 3) the Beaver Creek-Avon-Vail route. Up to 16 buses are used in this service, and they are distributed among

the routes according to demand. Funding is provided by a combination of passenger fares and monies assessed by the transportation task force members, which include the Beaver Creek Resort Co, Eagle County, and the towns of Vail, Avon, and Leadville. Voluntary contributions from the Transportation Task Force members make up the difference in operational costs not covered by rider fares. Total 1994 ridership in the system was as follows:

Leadville route	21,000
Highway 6 route	160,800
Beaver Creek-Avon-Vail route	158,200
Total	340,000

The Leadville route is operated primarily to transport employees living in Leadville and Red Cliff to Vail, Avon, and Beaver Creek. This route is operated year-round, but receives heaviest use during the ski season (Taylor, *pers. comm.*, 1994). A 1993 survey of Eagle County residents found that 7 percent take the bus to commute to work, while 80 percent use their personal vehicles and 6 percent walk (Richman 1994).

The U.S. Highway 6 route serves the towns of Edwards, Gypsum, Avon, and Vail, providing mainly employee transportation from communities on the west end of the valley to Avon, Vail, and Beaver Creek. This route is operated on a year-round basis, but the scale of operations is reduced once the ski season is over (Taylor, *pers. comm.*, 1994).

The Beaver Creek-Avon-Vail route is designed to transport employees, residents and skiers to other local communities. It is an express route that travels via I-70 and does not pick up passengers along the way. It is operated only during the winter ski season (Taylor, *pers. comm.*, 1994). In addition, the regional bus system

operates a route between Vail, Avon, and the Arrowhead Ski Area, designed to transport skiers from one resort to another. This route is served by only one bus. The Beaver Creek parking lots are sometimes used as park-and-ride lots for people going to Vail.

A new experimental route was operated in 1995. It connects the down-valley communities as far west as Gypsum to Vail and Beaver Creek. During its first month of operation, 1,654 passengers utilized its service. Two buses are allocated to this route, which provides morning and afternoon service. In 1994-95 Eagle County and the TOV set aside \$46,000 to operate the route from November 19 through April 6. Operational costs are also offset by passenger fares, which range from \$2 to \$5 per round trip. (*The Vail Valley Times* Dec. 23, 1994.)

The Avon/Beaver Creek Transit Services also operates free in-town bus routes in the town of Avon and the Beaver Creek Resort. Passengers on the Avon and Beaver Creek town bus systems can transfer to the down-valley bus lines and ride into Vail. The down-valley bus lines terminate at the Vail Transportation Center, allowing passengers to transfer to the TOV transportation system.

3.4.5.2.3 Other Transportation Services

Transportation from the Eagle County Regional Airport is provided by private transit companies, car rental services, and many hotels provide limousine service (Taylor, *pers. comm.*, 1994). In addition, several private transit companies connect Vail to the Denver International Airport and other ski resorts such as Aspen. The airport transit services reduce the number of rental cars in the Vail area.

Passenger service via railroad is not available in the Vail area. Amtrak operates one train each direction between Denver and Salt Lake City, but the nearest stop to Vail is Glenwood Springs (about 70 miles away). A proposal to implement a European style train network calls for acquiring the right to use the existing rail lines from the Southern Pacific Railroad, but implementation seems unlikely in the near-to-intermediate future (Inter-Mountain Regional Planning Commission 1994).

3.4.5.2.4 Air Transportation

The Eagle County Regional Airport is located approximately 40 miles from Vail near the town of Gypsum. Currently, about 25 percent of the guests arriving in the Vail area use the airport (*The Vail Daily Times* 1995). Nonstop jet service for the 1994-1995 ski season is now available from 18 major cities, in addition to connecting flights from over 130 cities worldwide on several major airlines. The airlines provide daily, Saturday, select days, and special service for holiday periods October through mid-April.

The increased air service to the regional airport is also partially attributable to marketing and promotional efforts which include the flight as part of a destination vacation package to the Vail Ski Area and other ski resorts in the region. An estimated 11 percent of the passengers arriving at the Eagle County airport were bound for resorts in Pitkin County during the 1993-1994 ski season. This percentage may increase for the 1994-1995 ski year because Sardy Field has lost some of its air service (*The Vail Daily Times*, Jan 18 1995).

Airline service into the Eagle County Airport has steadily increased, as shown by commercial enplanement records:

<u>Year</u>	<u>Passengers</u>
1989	300
1990	9,100
1991	28,700
1992	35,600
1993	53,000

In contrast, general aviation, although more difficult to measure, has remained more constant at approximately 20,000 to 25,000 persons (Richman 1994).

Recent improvements in the navigational aids to the airport has increased its ability to handle air traffic under adverse weather conditions. The airport facilities were improved for the 1994-1995 ski season, resulting in fewer flights being diverted from the airport due to poor weather conditions. The use of larger aircraft that are able to fly in more marginal conditions is also a factor increasing airport service (Reynolds 1995).

Though use of Eagle County Airport is increasing rapidly, most visitors to the Vail Ski Area arriving by air enter via the Denver International Airport (about 140 miles from the Vail Ski Area).

3.4.5.3 Parking

Day visitors to Vail who arrive in their personal vehicles typically park in one of the public parking structures and use the public transportation system or simply walk. As noted, the availability of parking spaces in Vail has been a concern. The 1986 EA noted that there were 2,337 community (public) parking spaces available in the TOV, of which 850 and 1,200 were located in the Vail Village and Lionshead parking structures, respectively. In projecting future demands at that time, it was noted that as many as 200 additional spaces would be needed to satisfy the 19,900 SAOT manage-to level of visitation. Since 1986, significant improvements to the public parking situation in Vail have occurred. Today, there are approximately 2,750 public spaces available in the TOV, including an additional 450 which have been constructed at the Vail Village structure, 1,200 at Lionshead, and 250 at Ford Park. The Ford Park lot has provisions for parking fee discounts for vehicles with multiple occupants.

As previously discussed, parking and transportation were two of the primary impacts identified in the 1986 EA/DN. The mitigation required by the 1986 DN has been accomplished, and the 19,900 SAOT manage-to capacity established in large part due to parking and transportation problems has been reaffirmed by the TOV and VA in the Agreement. Table 3.16 summarizes the change in the availability of public parking spaces in the TOV from 1986 to present.

Table 3.16. Public parking spaces at the Village and Lionshead structures and Ford Park		
Facility	1986	Present
Village Structure	850	1,300
Lionshead Structure	1,200	1,200
Ford Park	237	250
TOTAL	2,287	2,750

Existing public parking is generally adequate throughout most of the ski season. Felsburg (1993) projected that current parking would be sufficient for all but 6 days each ski season at the 19,900 SAOT level. In recent years the Village and Lionshead structures have simultaneously filled less than a few times each ski season. During the 1994-95 ski season, they were never simultaneously full (Grafel, *pers. comm.*, 1995). At points in the past,

overflow parking on the South Frontage Road has occurred. However, in recent years this has been a relatively uncommon event, and it did not occur during the 1994-95 ski season (Grafel, *pers. comm.*, 1995). Visitor safety and convenience are compromised when parking overflows to the frontage road, and CDOT does not condone the situation. In the past, occasional problems with overflow parking have been experienced during popular ski races, concerts, and other summer events.

Several management measures listed above have been implemented on a trial basis under the Holiday Traffic Management Plan, which can be implemented any time that problems are anticipated. The major employers in the Vail area, including VA, the TOV, and the Vail Valley Medical Center, which collectively employ over 4,500 individuals, encourage carpooling by reducing the parking fees for vehicles with multiple riders. They also encourage park and ride programs by providing free or discounted bus passes, staggering work schedules, and offering cafeteria vouchers for those participating in the programs (*The Vail Daily* 1994).

The summary of the Agreement (Strategies for the Future) indicates a renewed commitment by the TOV and VA to solve parking problems. It states: "if any future efforts by Vail Associates to modify its USFS permit on Vail Mountain result in increasing the allowable SAOT, Vail Associates will participate on a fair share basis in the addition of needed parking structures. At the same time, the TOV will continue to improve the efficient use of the existing winter parking situation through aggressive management techniques. VA and TOV will actively pursue park and ride sites for their employees and employees of the community..."

3.4.5.4 Transportation and Parking Summary

The traffic and parking problems in Vail are being managed and addressed through a variety of targeted actions. Traffic congestion problems at the main Vail interchange and associated intersection should be greatly improved now that the traffic roundabout is completed, and improvements to the West Vail interchange are under consideration. Driving in the Vail Village pedestrian core area is restricted for visitors and residents alike; however, an in-town bus service is available and convenient.

Vail is served by an extensive intercity public transit system that links the Vail Village core to East Vail and West Vail, as well as a regional transportation system linking Leadville, Avon, Beaver Creek Resort, Edwards, Eagle, and Gypsum. These systems, and separate intercity public transit systems in Avon and Beaver Creek, help to reduce the number of vehicles used in the area. Additionally, van services between Vail and the Eagle County Regional Airport and Denver International Airport are reducing the number of rental cars used by destination skiers.

The public parking spaces which in 1986 were estimated to be necessary in order to support visitation at the manage-to level, have been added. Except for a few days each year, existing parking is adequate. Local construction policies within the TOV and other communities address the requirement for developers, including VA to provide adequate parking. The provisions of the Agreement as a continuation of the "manage-to" framework established by the 1986 DN, and the continuation of the Parking Task Force provide a formal vehicle for monitoring, evaluating and adjusting the parking and transportation needs in the TOV.

3.4.6 VISUAL RESOURCES

3.4.6.1 General Description

The Cat III area comprises a visually diverse, mostly north-facing landscape, bounded on three sides by dominant ridge lines. Vegetation patterns within the area greatly affect the characteristic landscape. The area has a matrix of spruce-fir or lodgepole pine forest, interspersed with meadows and gladed conifer vegetation. The primary area of natural meadow occurs in Super Bowl, while the largest expanse of gladed area lies in Pete's Bowl. Much of the rest of the PA is comprised of mostly dense forested areas. However, the area in Lower Sun Down Bowl is mainly a pattern of aspen and meadow vegetation.

3.4.6.2 Visual Resources Management System

The Forest Service has adopted a Visual Resources Management System (VRMS 1974) to determine the appropriate levels of acceptable visual alteration across the entire forest landscape, for all management activities, including ski areas. As part of the Forest Planning process, existing visual conditions were inventoried for all lands on the WRNF and projected future uses were identified. Based on such information, visual quality objectives (VQOs) were established. Areas were placed into one of five categories of acceptable visual alteration including: preservation, retention, partial retention, modification, and maximum modification.

Based on this system, the CAT III area, under its current 1B Winter Sports Management Area Prescription, was assigned a VQO of "modification." This classification acknowledges and allows for management activities to alter and even dominate the landscape, as long as vegetation and landform alterations borrow from the naturally established line, form, color, and texture within the characteristic landscape. This means that management activities on these lands must be minimized, mitigated, and appear to be naturally occurring, retaining the overall rocky mountain character type. For example, evidence of ski trails is acceptable, but whenever possible trails should be created in a way that mimics previous disturbance patterns and natural landscape forms. The visual changes under this level of VQO are to be achieved within one year of project completion.

The analysis of the affects of alteration or development on a landscape are assessed on a range of sensitivity that includes the distance of a viewpoint from the disturbance. This includes:

- ◆ foreground - 0 to ½ mile
- ◆ middleground - ½ mile to 4 miles
- ◆ background - 4 to 10 miles.

Generally, landforms and special landscape features have more visual effect when viewed within the foreground zone and are particularly vulnerable to visual disturbances in that distance zone. As the perspective shifts to the background, alterations in the landscape become much less distinctive. Beyond 10 miles, alterations in landscape character become highly obscure.

3.4.6.3 Distant View Points

None of the CAT III area is visible from the I-70 corridor or U.S. Highway 24. However, portions of the CAT III area can be seen from several distant view points in the adjacent Wildernesses. At its closest point, the Eagles Nest Wilderness on the north side of I-70 is approximately 2 miles from the CAT III area. However, the elevational difference between the two areas means that the closest point that would allow any view into the CAT

III area would be over 4 miles away. A portion of the eastern boundary of the Holy Cross Wilderness is within 3.5 miles of the CAT III area. However, the closest point which would allow any view into the CAT III area would be well over 5 miles away.

3.4.6.4 Closer View points

During scoping, concern focused on the possible impact to visual resources as seen from within the Two Elk Creek drainage. These view points are described below.

3.4.6.4.1 Vail Mountain Ridge Line

Major portions of the CAT III area are visible as background views from the ridge line separating the front side of the ski area from the Back Bowls. Beginning at the eastern portion of the SUP in Mongolia Bowl and extending west to the Wildwood area, numerous panoramic views of the CAT III area are possible. As a popular summer recreation route, similar views are provided along upper sections of the Sleepytime Road.

3.4.6.4.2 Commando Run Trail

The Commando Run Trail begins in the vicinity of Shrine Pass and extends north approximately 15 miles, terminating in the TOV. Near the PA, this trail roughly follows the eastern boundary of the SUP in Commando Bowl. Extending further north, the trail traverses the eastern portion of Mongolia Bowl before entering the Mill Creek drainage. Along Commando Bowl, views into the PA are largely obscured by dense spruce-fir forest and the ridge line separating Commando and Pete's bowls. From that section of the Commando Run Trail extending through Mongolia Bowl and the developed ski area, middleground views of Commando, East Pete's, and portions of Pete's bowls are provided.

3.4.6.4.3 Two Elk Trail

The Two Elk Trail is about 9 miles long and links the Gore Creek Valley near east Vail with the Eagle River Valley near the Town of Minturn. In the PA, this trail roughly defines the northern boundary of the CAT III area. The extent of views along this section is greatly affected by topography. In the vicinity of Two Elk Pass, much of the lower portions of Commando and Pete's bowl are visible. However, moving west, the valley becomes more incised and only the very lowest sections of the slopes in East Pete's Bowl adjacent to Two Elk Creek, the Center Ridge area, and Super Bowl are visible. Similarly, views to the north in Lower Sun Down Bowl are mostly blocked by a foreground ridge.

3.4.7 TIMBER RESOURCES

This section focuses on the potential for commercial utilization of forest products which could be made available by clearing trees for ski trails, lifts, and other facilities in the CAT III area. The biological aspect of forested vegetation is discussed in the Vegetation section of this chapter.

3.4.7.1 Existing Timber

The timber resource in the PA consists of Englemann spruce, subalpine fir, lodgepole pine and aspen. Providing they meet merchantability standards, all of these species are considered to have commercial value. Table 3.17 summarizes the approximate volume of commercial timber within the CAT III area. The volumes are expressed

in million board-feet of timber (mmbf). For reference, construction of an average three-bedroom home requires roughly 12,000 board-feet of timber.

Table 3.17. Volume of timber in the CAT III area by species.		
Species	Volume of Sawlogs (mmbf)	Volume of Products other Than Logs (mmbf)
Aspen	0	5.5
Engelmann Spruce/Subalpine Fir	19.3	1.6
Lodgepole Pine	18.7	2.0

3.4.7.2 Commercial Value

It is important to note that the primary objective of the Proposed Action and alternatives is to develop additional ski terrain, not to produce commercial timber. The current management direction (USDA-FS 1984) for the CAT III area emphasizes downhill skiing recreation, but allows for timber harvest as a means to enhance visual quality, diversity, recreation opportunities, and to provide for healthy forest cover. Forest Service policy (USDA-FS 1994d) on timber disposal from ski areas also stipulates that resource protection be considered in determining whether the permittee will be charged for otherwise merchantable timber which would be cut.

The CAT III area contains a substantial amount of timber with commercial value. Forest Service policy (USDA-FS 1994d) requires that ski area permittees be charged fair market value for merchantable timber cleared for ski development purposes. Generally, live and dead conifer trees which are greater than 7 to 8 inches in diameter and at least 8 feet in length are considered "merchantable." Merchantability standards have also been established for "products other than logs" (POTL), which includes both live and dead trees, trees less than 7 to 8 inches in diameter, and aspen. Trees cleared which do not meet these standards are usually available to the permittee without charge, or as "free use" timber. Timber values are determined by Region Two policy (FSH 2904.22) which establishes a standard, or base rate for commercial timber throughout the Region. Actual rates are adjusted from this figure based on a site-specific timber appraisal.

3.4.7.3 Harvest Options

Forest Service guidelines also include standards for determining whether timber should be removed from steep or sensitive terrain. Generally, areas with slopes less than about 40 percent are suitable for timber harvest using ground-based logging equipment such as a rubber-tired skidder. In order to minimize impacts to soils, water and other sensitive resources, merchantable timber which is located farther than about 1,000 feet from an existing road, or on slopes steeper than about 40 percent slope, is generally not authorized for removal. In this case, the permittee is not charged for the material. About 88 percent of the merchantable sawlog volume and 57 percent of the volume of POTL is located on slopes less than 40 percent.

No timber harvest has taken place within the CAT III area and there are no plans which would connect the CAT III area ski developments with future timber sales in adjacent areas. However, timber harvests have occurred or are in progress in Lime Creek, Timber Creek, and Turkey Creek in the vicinity of the CAT III area. All of the lands within the Vail Ski Area SUP area are included in the WRNF's suitable timber base. This means that this area is factored into the Forest's calculated potential for sustainable timber production over the long term, or "allowable sale quantity."

3.4.7.3.1 Haul Routes

No roads are located in the CAT III area which would facilitate removal of timber. However, a road and skiway system is in place through the Back Bowls and the front side of the ski area which could support logging truck traffic. To the south of the CAT III area, a fairly extensive road system exists. At its closest point in the Lime Creek drainage, it comes within about 1.1 miles of the CAT III area. Forest Service policy requires that appraised timber sale values take into account the haul distance to the certain sawmills. In accordance with Region Two policy, commercial timber is appraised based on hauling costs to Kremmling, Colorado. Even though this saw mill has been closed for several years, this is the comparative base. The timber cut from most large timber sales in the area is hauled to Saratoga, Wyoming, for processing.

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CHAPTER 4.0 ENVIRONMENTAL CONSEQUENCES

This chapter discusses the direct, indirect, and cumulative environmental consequences of implementing the Proposed Action and alternatives to that action as described in Chapter 2. It is the basis for comparing the impacts associated with each alternative to the existing conditions described in Chapter 3. The effects considered include ecological, aesthetic, historical, cultural, economic, social, or health-related resources (40 CFR 1508.8). Such impacts can occur both within and outside of the Project Area. This chapter also discusses relationships between short-term uses of man's environment, the maintenance and enhancement of long-term productivity, and a description of irreversible and irretrievable commitment of resources.

4.1 INTRODUCTION AND ASSUMPTIONS REGARDING MITIGATION AND CUMULATIVE IMPACTS

Under NEPA, actions which could "significantly" affect the quality of the human environment must be disclosed and analyzed in terms of the "context and intensity" which make them significant. Context refers to the effect of the action on all levels of society, while intensity is the severity of the impact on the resource or resources which might be affected. For an action to have an effect, it must have a demonstrable causal relationship which can be direct, indirect, or cumulative in nature (40 CFR 1508.27).

The duration of an impact is important in determining context and intensity. Typically, short-term effects involve normal construction and development activities of limited duration which are scheduled and monitored. Long-term impacts may be equally predictable, but extend beyond construction, and may become permanent.

- ◆ A direct effect is caused by the action and occurs at the same time and place and is thus a short-term effect. The effect can result from a development activity, including construction, operation, and maintenance (40 CFR 1508.8 [a]). Both indirect and cumulative effects stem from direct effects.
- ◆ An indirect effect is a reasonably foreseeable impact that is also caused by the action, but is removed by time or distance. These are generally more long-term impacts which are induced by the action (40 CFR 1508[b]).
- ◆ Cumulative effects are an aggregate of the incremental impacts of the action when added to past, present, and reasonably foreseeable future actions, including activities by other parties. These effects can result from individually minor impacts which collectively become significant over time (40 CFR 1508.7). Both indirect and cumulative effects are long-term (beyond construction phase) impacts.

In the discussion which follows, the potential effects of each alternative are identified and discussed by resource. The impacts are categorized as direct, indirect, or cumulative. This chapter also discloses the unavoidable adverse impacts and the irreversible and irretrievable commitments of resources. This treatment of effects is considerably more detailed than the summary of potential impacts and mitigation measures at the end of Chapter 2.

4.1.1 MITIGATION

In basic terms, mitigation is a solution to an environmental problem. CEQ regulations require that mitigation measures cover the entire range of potential impacts of the proposal. Further, these regulations provide that measures which could improve the project be identified in the EIS and that the probability of their implementation be disclosed (40 CFR 1508.20, Question #19). However, the lead agency is not required to present a detailed mitigation plan or make a commitment to implementing mitigation measures. Forest Service policy dictates that an EIS includes discussion of means to mitigate adverse environmental impacts that are not already covered in the description of the Proposed Action or alternatives to it. Forest Service policy also requires that mitigation measures, management requirements, and monitoring provisions that are pertinent to environmental concerns be discussed.

This chapter describes impacts disclosed by analysis as well as potential mitigation measures to offset those impacts. It also identifies impacts that would remain even after mitigation. Specifically required mitigation measures will be prescribed in Final EIS and ROD. CEQ regulations define five primary categories of mitigation under NEPA. They are:

- 1) avoiding the impact altogether by not taking a certain part or parts of the action;
- 2) minimizing impacts by limiting the degree or magnitude of the action or its implementation;
- 3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- 4) reducing or eliminating the impact over time by preservation and maintenance during the life of the action; and
- 5) compensating for the impact by replacing or providing substitute resources or environments.

4.1.2 CUMULATIVE ACTIONS

A cumulative action (40 CFR 1508.25(a)(2)) is one "which when viewed with other proposed actions [has] cumulatively significant impacts." Past and ongoing activities and those that are in the reasonably foreseeable future are briefly identified below in order to assist the reader in understanding the cumulative effects associated with the proposed project. This list is not intended to be totally inclusive, especially for relatively small, isolated projects. The activities described under the No Action Alternative in Chapter 2 and Affected Environment in Chapter 3, should also be included as background information useful in assessing cumulative effects. Certain kinds of activities, such as general development or increases in use, are represented by specific projects, but could occur in other forms or locations as well. Some disciplines or areas of interest would be affected by several or even all of the described activities while others could be affected very little or not at all. How the Proposed Action or alternatives to it would contribute to potential impacts for a given discipline or resource in a cumulative fashion, is the topic of the cumulative effects analysis in each section.

4.1.2.1 Past and Ongoing Activities

Activity Type/Project: Development within the TOV

Location: Within the town boundary of Vail

Description: The TOV is maturing and filling in the spaces still available for development. This activity usually results in the conversion of open areas into real estate, roads, parking lots, or other forms of development. Development of this type would also occur in the foreseeable future—but to a more limited degree. As the TOV is being developed, progress is being made to secure and preserve the remaining open space.

Activity Type/Project: Development within Eagle County

Location: Throughout Eagle County

Description: Eagle County is growing and developing, which results in effects similar to those associated with development within the TOV, but over a wider area. Housing, roads, and other forms of development occur as minor (single houses) and major (building complexes and large buildings) forms. Examples of development are the Wildridge, Singletree, Morning Star, and Cordillera developments and Bachelor Gulch at Beaver Creek Ski Area.

Activity Type/Project: Ski area improvements

Location: Eagle County, Beaver Creek and Arrowhead ski areas

Description: Beaver Creek Ski Area is continuing to develop within its SUP and PUD through implementing the Master Plan and building out its base area, as well as some already approved on-mountain ski facility improvements. These activities have occurred in the recent past and are also ongoing. Similarly, some improvements on private land for the Arrowhead Ski Area are also planned.

Activity Type/Project: Vail Ski Area developments and operations

Location: CAT I and II areas within the SUP boundary

Description: Implementation of the 1986 MDP and continued maintenance and operation of existing facilities and programs as described in the No Action Alternative. This includes construction of several lifts and trails and upgrades to existing lifts, as well as maintenance and renovation of other structures and facilities. The current offering of summer recreation programs and activities within the CAT I and II areas would continue.

Activity Type/Project: Dispersed, backcountry recreation

Location: Throughout the Holy Cross Ranger District, but especially in the Shrine Pass, Vail Pass, Turkey Creek, and Two Elk Creek areas.

Description: As visitor (especially summer) numbers increase and the local population grows, the backcountry has become more intensively used. In particular, mountain biking, hiking, horseback riding, and four-wheeling have grown in popularity. During the winter, snowmobiling and cross-country skiing are popular in the Vail Pass, Shrine Pass, and Turkey Creek areas. It is foreseeable that all of these activities will likely continue to grow in popularity.

Activity Type/Project: Improvements to TOV traffic facilities including the roundabouts and I-70 access

Location: TOV

Description: A roundabout has been built at the main Vail intersection near Vail Village, and a second roundabout is being considered for the West Vail interchange. The Vail Village roundabout is projected by the TOV to solve recurrent traffic flow and distribution problems during peak and high use periods. Also, improvements to I-70 and its

associated frontage roads are under consideration. Parking is being added as projects are built, particularly commercial hotels.

Activity Type/Project: Grazing, mining, timber harvest, and mineral development

Location: NFS lands throughout the area

Description: Grazing allotments have been in existence and operated for many years and will continue to be in operation during the present and future. Mining has been reduced in the past but upsurges could occur as market and technological changes occur. Mining is ongoing near Leadville and will continue as part of the region's economy. Timber harvest associated with ongoing sales within the general area will probably continue.

Activity Type/Project: Construction of the Game Creek Club

Location: On private land in Game Creek Bowl on Vail Mountain

Description: VA is completing construction of a 170-seat club facility housing a restaurant, bar, and caretaker's apartment.

4.1.2.2 Reasonably Foreseeable Activities

Activity Type/Project: Timber harvest

Location: Holy Cross Ranger District, including Timber Creek east of Vail Ski Area and Lime Creek adjacent and south of VA's SUP

Description: Future timber sales are possible in a variety of locations but there is the possibility of a future timber sale in the Timber Creek area; a final harvest entry is possible in the Lime Creek area. Actual harvest would depend on future market conditions and site-specific environmental considerations, including wildlife and biodiversity.

Activity Type/Project: Potential real estate development

Location: Battle Mountain in the Gilman/Red Cliff area

Description: A potential real estate development on private land on Battle Mountain near the Gilman/Red Cliff area. This parcel has been considered for development (various options are possible) but has not developed into a clear plan or proposal. Consequently, the feasibility, costs, and potential impacts have not been evaluated. It would require consideration by Eagle County and adjoining municipalities. Any developed access to NFS lands may require federal analysis and disclosure. VA has an interest in the parcel but is not solely in control of plans or proposals for its potential development.

Activity Type/Project: Adam's Rib Ski Area

Location: South and east of Eagle

Description: A proposed new ski area that would involve extensive skiing facilities, a base village, substantial real estate and commercial development, and new infrastructure at a previously undeveloped site. Planning and permitting efforts have been underway for years.

Activity Type/Project: Major potential water development, including Iron Mountain Reservoir near Red Cliff and the Homestake II, Wolcott, and Eagle-Piney projects

Location: Near Red Cliff (Iron Mountain Reservoir) and various other locations in Eagle County

Description: Iron Mountain is a reservoir project that has been considered in various forms over the past several

years. It would inundate several hundred acres of riparian/wetland habitat near Red Cliff. It would impound waters for complex Front Range water development programs and other purposes. Other potential water development projects have also been considered over the past several years. In most cases planning is not complete, and analysis and permitting has not begun.

4.2 PHYSICAL ENVIRONMENT

4.2.1 GEOLOGY, SOILS, AND HYDROLOGY

Given that impacts to geology, soils, and hydrology are interrelated and tend to occur on a watershed scale (i.e., impacts to these resources are generally confined to the drainage basin in which they occur) the treatment of these disciplines has been combined into one section for the purpose of analysis. In terms of geology and soils, the analysis of possible impacts is concentrated in identified areas of greater concern for slope stability, soil erosion, and revegetation difficulties as outlined in Chapter 3. Hydrologic effects addressed in this section focus on potential impacts to water quality as a result of ski facility construction and increased water yield resulting from ski trail clearing.

4.2.1.1 Direct and Indirect Impacts

4.2.1.1.1 Impacts Common to All Alternatives

4.2.1.1.1.1 Geological Hazards and Constraints

Geological hazards and constraints associated with this project involve considerations common to the Minturn formation as it occurs on the front side of Vail Mountain and generally throughout Eagle County. Landscapes underlain by the Minturn formation are greatly influenced by large-scale mass wasting, localized landslides and slope failures in the past. Even though a great deal of development has occurred around the area, slopes underlain by the Minturn formation are frequently susceptible to slumps, landslides, and earth and mudflows. These processes may be exacerbated, sometimes through human activities such as road cuts or other activities which may result in the disruption of subsurface drainage. These problems are most pronounced in locations where shale members of the Minturn formation are near the surface.

Ski development activities which most affect the potential for triggering mass movement involve excavation for roads and skiways in areas already prone to instability. In these cases, road cuts can weaken the soil mantle and initiate a slump or landslide. Improper road drainage can exacerbate this situation by adding additional weight and lubricating the soil mass. Excavations along the toe of slopes tend to carry greater risk of mass movement because the underpinning of the slope may be removed.

The grading of ski trails and removal of vegetation also tends to decrease slope stability. In both cases, soil moisture levels generally increase because evaporation and transpiration losses from vegetation are reduced.

Also, grading often involves the removal of tree stumps and portions of root systems which tend to anchor the soil mantle.

As noted in Chapter 3, there are three main categories of geologic considerations associated with the potential development of the PA: these include areas of geologic hazard, geologic constraints, and areas with no identified geologic concern (or non-hazardous areas). Impacts common to all action alternatives relative to these classes are described below.

A number of CAT III developments would occur on areas with no identifiable geologic hazard or constraint, or on non-hazard areas (Figure 3.1). These include the upper terminals of all lifts, support facilities such as shelters, restrooms, ski patrol buildings, and upper sections of many ski trails, skiways, and roads.

Just as on the front side of Vail Ski Area, potentially unstable slope (PUS) areas comprise a major portion of the CAT III area. Accordingly, a large number of the facilities proposed under any of the action alternatives would be located in PUS areas. As noted in Chapter 3, PUS areas are locations with geologic constraints where, with proper siting, design, construction, and maintenance, facilities can generally be located without significantly affecting slope stability. Regardless, steeper areas on the lower one-third of most slopes would merit special attention during design and construction, including lower Tea Cup Bowl Skiway/Road, lower Pete's Skiway/Road, the Intertie Skiway, and West Super Bowl Skiway/Road. The approximate acreage of PUS areas which would be affected by each of the alternatives is displayed in Table 4.1.

Table 4.1. Summary of geologic hazard and constraint units by alternative													
Geologic Hazard(H) or Constraint Type	Center Ridge Alternative				Proposed Action				Master Development Plan				
	Gladed		Graded		Gladed		Graded		Gladed		Graded		
	Acres of trail	Acres disturbed	Acres of facility	Acres disturbed	Acres of trail	Acres disturbed	Acres of facility	Acres disturbed	Acres of trail	Acres disturbed	Acres of facility	Acres disturbed	
PUS	187	23	165	149	359	45	295	266	532	67	426	383	
US(H)	0	0	0	0	1	0	1	1	1	0	1	1	
DMA(H)	1	0	1	1	1	0	1	1	2	0	2	2	
DSA(H)	0	0	0	0	0	0	0	0	0	0	0	0	
RF(H)	0	0	7	6	4	1	10	9	12	2	18	16	
TOTAL	188	23	173	156	365	46	307	277	547	69	447	402	
Total Acres Disturbed in Type C				172					311				450
Total Acres Disturbed in Type H				7					12				21
<p>Gladed runs were assessed a disturbance factor of 12.5%, i.e., 12.5% of areas subject to glading would be the maximum amount of ground disturbance that could occur under this treatment.</p> <p>Graded runs were assessed a disturbance factor of 90%. Because some skiway/roads are 100% graded, this factor may underestimate ground disturbance by 4 to 11 acres depending on the alternative.</p> <p>Acres disturbed refers to the area of ground that would be altered or need to be rehabilitated following construction of a trail or facility.</p> <p>Facilities for which grading would occur include skiways, roads, restaurant and food deck sites, and utility corridors.</p>													

Overall, areas of actual geologic hazard are not extensive in the CAT III area, and the facilities associated with any of the alternatives would generally avoid these locations. Geologic hazard areas identified and described in Chapter 3 include unstable slopes (US), debris-mudflow areas (DMA), debris slide and debris avalanche prone slopes (DSA), and rockfall areas (RF). While mostly avoided, portions of some facilities are located in DMA and RF areas. DMAs are fan-shaped areas which lie at the base of steep tributaries to Two Elk Creek and are subject to periodic depositions of mud, boulders, or other debris during floods or periods of exceptionally high runoff. Because DMAs are depositional features, construction in these areas is not likely to initiate slope failures. However, site-specific studies may be needed to determine the nature and extent of hazards located upslope in order to develop measures to protect facilities located in DMAs. RF hazards are zones on and below cliffs and rock outcrops. Due to map scale limitations, these areas are often depicted in a way that makes them appear more extensive than is actually the case. For instance, a large section of the existing Sleepytime Road is located in a RF area and poses no unusual geologic concern. Specific lift tower locations would be designed to compensate for RF hazards, and these designs would consider measures such as pinning loose rocks, installing deflection devices, and repositioning towers. The approximate acreage of the various geologic units affected by each of the alternatives is displayed in Table 4.1.

4.2.1.1.1.2 Soils

Most soils in the PA have formed in the colluvial and residual material derived from sandstone and limestone of the Minturn formation. As such, soils in the PA tend to be quite similar to those found on the front side of Vail Ski Area and have many of the same management characteristics. In general, soils in the PA are moderately susceptible to erosion and compaction and have moderate limitations for revegetation. In addition, most soils in the CAT III area also have moderate limitations for unsurfaced roads. The analysis in this section focuses on those areas where soil conditions present a more serious concern and have limitations or hazards rated as "severe" for a particular use. It should be noted that a severe or high rating does not necessarily imply that a given soil is unsuitable for a particular use. Instead, these ratings indicate one or more unfavorable soil characteristics that may require special consideration in the design or construction of facilities or for which development would be more costly to implement (Walsh and Associates 1993).

Ski area development activities that involve grading and excavation tend to have the greatest potential for detrimental soils impacts. These disturbances remove vegetation as well as protective mulch and litter cover, thus exposing bare mineral soil to the forces of sheet and rill erosion. Although it is a natural process occurring even in undisturbed watersheds, when surface erosion exceeds the rate of soil formation, it can permanently impair land productivity. Using the Modified Universal Soil Loss Equation (MSLE) (Warrington et. al. 1980) as a guide, soil loss tolerance levels are sometimes used to assess whether long-term site productivity can be maintained.

In applying the MSLE approach to ski area development situations, it is apparent that two of the more effective ways soil erosion can be maintained within acceptable limits are reducing the slope length over which runoff would flow and promptly seeding and applying mulch to disturbed areas. The use of waterbars (which decrease effective slope length) and revegetation are required practices in summer operations at Vail Ski Area and have been adapted over the years to be generally quite effective. These practices would be required for any development in the CAT III area. Use of the MSLE approach indicates that ski trails constructed on slopes over about 35 percent would require placement of water bars at intervals of 50 to 100 feet, and application of mulch covering at least 80 percent of the disturbed soils. In most cases, conventional ski trail construction in the CAT III area would be limited to slopes less than 35 percent.

Soil compaction can also be a concern in ski area development. Especially when soils are moist, heavy equipment traffic can compress soil materials, thus reducing pore space and available water capacity and impeding root growth. Most soils in the PA are rated as having a moderate potential for compaction (Walsh and Associates 1993). In addition, under all action alternatives, construction operations would not begin until July, further reducing the potential for compaction of moist soils.

On a broader scale, maintenance of soil productivity can also be assessed by examining the areal extent of lands impacted by disturbances such as accelerated erosion, high levels of compaction, or severe burning. According to the Forest Service's Watershed Conservation Practices Handbook, land areas in these categories should not exceed about 15 percent of an activity area, excluding the permanent transportation system (USDA-FS 1995a). In this case, the activity area would be the PA. Among the alternatives, the portion of land that would be impacted due to construction of conventional ski trails, skiways, lifts, restaurants, and the permanent transportation system ranges from about 5.6 percent of the PA in the Center Ridge Alternative to about 15.1 percent under the MDP Alternative.

The location of potential soil impacts associated with each of the action alternatives is depicted in Figures 4.2, 4.7, and 4.10. The total extent of disturbed soils, by soil map unit, is shown in Table 4.2. It should be noted that the acreage shown provides an estimate of the amount of exposed, bare soils (hereafter referred to as "disturbed") that would occur as a result of implementing each of the alternatives. These are areas that would require revegetation following construction in conformance with Forest Service standards outlined in VA's Summer Operating and Construction Plans, Storm Water Management Plan, and other applicable documents. Finally, it should also be noted that these disturbances would occur over a period of 3 to 7 years, depending on the alternative. The acreages shown in Table 4.2 do not coincide with figures in other sections in this EIS such as Alpine Skiing and Vegetation. This discrepancy occurs because grading and excavation are performed on a more limited basis than vegetation clearing and because skiable terrain includes substantial acreage of naturally open areas for which no soil disturbance need take place. Depending on the alternative, these naturally open areas would account for about 28 to 46 percent of the developed skiable terrain.

Table 4.2. Summary of treatments to soil units in the CAT III area by alternative

Soil Map Unit	Center Ridge Alternative				Proposed Action				Master Development Plan			
	Gladed		Graded		Gladed		Graded		Gladed		Graded	
	Acres of trail	Acres disturbed	Acres of facility	Acres disturbed	Acres of trail	Acres disturbed	Acres of facility	Acres disturbed	Acres of trail	Acres disturbed	Acres of facility	Acres disturbed
111	0	0	2	1	1	0	2	2	6	1	6	5
115	0	0	0	0	0	0	0	0	0	0	0	0
123	0	0	2	2	0	0	2	2	0	0	2	2
127	0	0	0	0	0	0	2	2	0	0	2	2
133	1	0	2	2	4	1	7	7	13	2	14	13
134	0	0	0	0	2	0	7	7	4	1	13	13
153	1	0	1	1	1	0	1	1	3	0	2	2
161	0	0	0	0	1	0	13	12	36	4	31	28

Soil Map Unit	Center Ridge Alternative				Proposed Action				Master Development Plan				
	Gladed		Graded		Gladed		Graded		Gladed		Graded		
	Acres of trail	Acres distur- bed	Acres of facility	Acres distur- bed	Acres of trail	Acres distur- bed	Acres of facility	Acres distur- bed	Acres of trail	Acres distur- bed	Acres of facility	Acres distur- bed	
203	0	0	3	3	0	0	5	5	0	0	5	5	
214	10	1	9	8	10	1	5	5	10	1	6	5	
215	0	0	3	2	0	0	3	2	0	0	3	2	
222	2	0	2	2	2	0	55	5	2	0	5	5	
223	12	1	9	8	12	2	11	10	15	2	9	8	
224	11	1	2	2	11	1	2	2	11	1	3	2	
225	1	0	13	12	1	0	13	12	11	1	16	14	
227	0	0	0	0	0	0	0	0	0	0	5	5	
234	0	0	0	0	0	0	0	0	8	1	10	9	
314	25	3	8	7	25	3	2	2	25	3	0	0	
413	0	0	1	1	0	0	1	1	0	0	2	2	
417	0	0	0	0	10	1	13	11	10	1	22	20	
428	0	0	0	0	0	0	0	0	1	0	7	7	
444	0	0	4	4	0	0	7	6	0	0	7	6	
513	1	0	0	0	1	0	0	0	3	0	1	1	
514	0	0	0	0	0	0	0	0	6	1	1	1	
515	0	0	2	2	0	0	2	2	0	0	3	3	
516	0	0	0	0	0	0	0	0	7	1	10	9	
517	90	11	94	84	90	11	93	83	96	12	91	82	
523	4	0	11	10	38	5	37	33	57	7	58	52	
524	14	2	21	19	60	7	55	50	78	10	74	66	
527	43	5	23	20	125	16	80	71	182	23	121	109	
529	0	0	0	0	29	4	27	24	82	10	74	66	
617	10	1	6	6	10	1	6	5	10	1	7	6	
623	0	0	0	0	0	0	0	0	0	0	1	1	
625	0	0	0	0	2	0	1	1	7	1	4	4	
628	0	0	0	0	0	0	1	1	2	0	3	2	
713	0	0	0	0	6	0	5	5	9	1	5	5	
TOTAL	225	29	218	196	441	53	458	369	694	85	623	562	
Total Acres Disturbed				225					422				647

Soil Map Unit	Center Ridge Alternative				Proposed Action				Master Development Plan			
	Gladed		Graded		Gladed		Graded		Gladed		Graded	
	Acres of trail	Acres disturbed	Acres of facility	Acres disturbed	Acres of trail	Acres disturbed	Acres of facility	Acres disturbed	Acres of trail	Acres disturbed	Acres of facility	Acres disturbed
<p>Gladed runs were assessed a soil disturbance factor of 12.5% i.e., 12.5% of areas subject to glading would be the maximum amount of soil disturbance that could occur under this treatment.</p> <p>Graded runs were assessed a soil disturbance factor of 90%. Because some skiway/roads are 100% graded, this factor may underestimate soil disturbance by 4-11 acres depending on the alternative.</p> <p>Acres disturbed refers to the area of soil that would altered or need to be revegetated following construction of a trail or facility.</p> <p>Facilities for which grading would occur include skiways, roads, restaurant and food deck sites, and utility corridors.</p>												

4.2.1.1.1.3 Hydrology

Potential impacts to hydrologic resources due to implementation of any one of the three action alternatives can be separated into two categories: 1) impacts to water quantity and 2) impacts to water quality.

Water Quantity

In terms of potential water depletions in the upper Colorado River drainage, it is important to note that there would be no water withdrawn from the Two Elk Creek watershed as a result of Vail's proposed CAT III area development. No snowmaking has been proposed, and all culinary water supplies would be piped into the area from the front side of Vail Mountain. Likewise, all wastewater would be pumped back over the mountain and run through existing treatment facilities. Consequently, reductions in water quantity within the Two Elk Creek watershed would not occur as a result of the CAT III area development.

In certain situations, such as large-scale timber harvest operations and some ski area developments, vegetation removal can result in increased water yields from affected watersheds. Removing timber creates pockets in which snow can accumulate and reduces the amount of surface area from which intercepted precipitation can be lost through sublimation or evaporation. It also reduces the amount of soil water transpired by vegetation during the growing season. As a result of these factors, vegetation removal generally increases the quantity of snowmelt runoff and extends its duration. However, increased water yields do not necessarily result in increased streamflows. Potential increases can be absorbed by lower elevation vegetation and/or increased groundwater recharge may occur. Also, during the winter, there can be increased ablation or wind scour losses from larger openings (Troendle and Leaf 1980).

For the purposes of this EIS, potential increases in water yield associated with each of the action alternatives were estimated using a water yield model developed as part of the Colorado Ski Country USA Water Management Research Project (Wright Water Engineers and Leaf 1986). This model generates potential increases in water yield based on changes in evapotranspiration that occur as a result of forest clearing and seasonal precipitation. Detailed results of this model may be found in the Hydrology Technical Report for the Vail CAT III area development (Pioneer 1995a). In reference to the No Action Alternative, a baseline water yield of 8,600 acre-feet per year for the upper Two Elk Creek watershed was calculated through the synthetic hydrograph process noted in the Hydrology section of Chapter 3.

Another aspect of water quantity concerns the question of how a particular watershed responds to different intensity precipitation or storm events. This issue is important because it addresses the extent to which Two Elk Creek and its tributaries can withstand increased storm flows without undergoing a loss of channel stability. The destabilization of stream channels can result in bank sloughing, aggradation and degradation, and other forms of channel erosion and sedimentation. These processes may in turn cause increases in stream turbidity and substrate embeddedness, thereby decreasing the quality of aquatic habitats. An analysis of precipitation-runoff was undertaken to assess the changes in runoff expected under the various action alternatives. For these analyses, two storm events were modeled utilizing the HEC-1 Flood Hydrograph Package (ACOE 1981): a 25-year, 1-hour event (1.23 inches of rain) and a 10-year, 24-hour event (1.83 inches of rain). Model results indicate that, due to the relatively high initial abstraction (surface ponding, etc.) and infiltration characteristics of the upper Two Elk Creek watershed and the relatively low storm precipitation depth, no runoff was produced by the 25-year, 1-hour event (Pioneer 1995a). Consequently, this particular analysis will not be discussed further. Results of the 10-year, 24-hour storm event runoff model are presented in the discussion of individual alternatives below.

Water Quality

Potential impacts to water quality associated with the various action alternatives include soil erosion and subsequent stream sedimentation resulting from construction activities. Potential impacts to water quality associated with stream sedimentation have been analyzed through two separate methods. The first of these utilizes a concept called "connected disturbed areas" (Ohlander 1992, USDA-FS 1995a). Connected disturbed areas (CDAs) include "roads and other soil disturbances [that] often act as man-made channels that deliver material directly to the natural stream network during rainstorms and snowmelt" (USDA-FS 1995a). According to the Forest Service's Watershed Conservation Practices Handbook (USDA-FS 1995a), in order to preserve hydrologic function and control erosion and sedimentation, projects should not increase the extent of CDAs in any watershed and furthermore should reduce CDAs to as near zero as feasible (USDA-FS 1995a).

Protection of water quality is an important consideration in ski facility design and construction. By applying mulch and installing water bars, sediment traps, filter fences, and by simple avoidance, CDA's are not generally created in ski trail and road construction. Regardless, an assessment of areas with the potential to become CDA's offers a means to address the relative sediment delivery potential of the various alternatives under consideration. For the purposes of this analysis, a *Potential* CDA (PCDA) is defined as an area of ground disturbance occurring within 100 feet of a stream channel. Thus, all bridges or other stream crossings, as well as roads, skiways, ski trails, lift terminals, and other graded areas occurring within 100 feet of Two Elk Creek or its tributaries would comprise PCDA's. It is important to note that CDAs can become "disconnected" from stream channels, i.e. runoff and sedimentation reduced to a minimum, through the application of watershed mitigation measures such as those noted above. The analysis which follows later in this section indicates the extent of area which would qualify as a PCDA under each of the alternatives. It is important to note that the PCDA analysis (Pioneer 1995a) includes map scale limitations. That, together with the fact that this approach does not incorporate detailed design and mitigation considerations, emphasizes the need to consider the relative-versus-absolute nature of the PCDA assessment.

The second method of assessing potential impacts to water was through use of the WRENSS model (Warrington et al. 1980) adapted to this project. This approach utilizes an estimate of on-site erosion using the Modified Soil Loss Equation (MLSE) and a coefficient for routing efficiency to estimate the amount of sediment potentially delivered to Two Elk Creek. Using this procedure, estimates were made of both natural and existing sediment delivery from disturbed areas in the Two Elk Creek watershed, and the amount of additional sediment which could be generated by each of the CAT III area development alternatives. Similar to the CDA analysis above, this

procedure was intended to provide a relative comparison among the alternatives, rather than to provide absolute values. As such, only the factors which readily lent themselves to use in the MSLE (such as basic revegetation practices and standard drainage spacing) were employed. As a consequence, more detailed and effective water quality protection measures were not factored into the assessment, and the estimates presented later in this section are likely to be conservative (over-estimated). Using the WRENSS model adapted to this analysis, approximately 172 tons of sediment would be delivered to upper Two Elk Creek each year. Figure 4.5 indicated relative sediment delivery in addition to this amount for each of the alternatives.

It should be noted that the above model calculates soil loss and sedimentation likely to occur on an annual basis under normal levels of precipitation. It does not account for individual storm events which, depending on their location and timing, could result in substantial amounts of sediment delivered to Two Elk Creek. For example, under any of the action alternatives, if a severe storm event occurred during or immediately after the grading of a new road or ski trail, the amount of sediment delivery associated with such an event would have the potential to cause severe, albeit most likely short-term, impacts to water quality. In addition to sedimentation, petroleum products, concrete wash, and other substances associated with construction and the use of heavy machinery could also be delivered to nearby stream channels. While the likelihood of such events is difficult to quantify and the use of BMPs outlined in Vail's Summer Operating Plan (VA 1994b) and Storm Water Management Plan (VA 1994c) would help to ameliorate associated impacts, the potential for the occurrence of such events does exist.

Above and beyond the specific impacts associated with the Proposed Action and its alternatives, additional impacts to geology, soils, and hydrology would likely occur as a result of timber management in the CAT III area. The three options for disposal of the timber removed as a result of skiway/road, and ski trail construction include: 1) burning the timber on site, 2) using the new ski area roads and ski trails for hauling out merchantable timber, and 3) utilizing more sophisticated techniques such as helicopter or cable-logging to remove saleable timber from the CAT III area. For a detailed discussion of potential impacts associated with the above timber removal options refer to the Timber Resources section.

4.2.1.1.2 Alternative A - No Action

Under this alternative, potential impacts to geology, soils, and hydrology are likely to occur primarily as a result of natural processes, existing ski facilities, and future, previously approved developments in the CAT II area. In addition, the presence of and recreational use associated with the Two Elk and Commando Run Trails would continue to affect these resources. Associated potential impacts are discussed below and under Cumulative Impacts in the Geology, Soils, and Hydrology section.

4.2.1.1.2.1 Geological Hazards and Constraints

Given that there would be no development of the CAT III area under Alternative A, there would be no associated, human-caused impacts to areas of geological hazard within the PA. The geologic landforms and hazard units would remain as they are described in the Affected Environment section of Chapter 3. However, this is not to suggest that these areas are static. Normal geologic processes continue to operate within the CAT III area. Thus, despite the fact that there would be no development undertaken in the area with this alternative, various landslides and other forms of mass wasting would continue to occur at ambient levels as a result of natural processes.

4.2.1.1.2.2 Soils

Just as with geological hazards, there would be no human-caused impacts to soils within the CAT III area under the No Action Alternative. However, soil formation as well as soil loss would continue to occur at natural, background levels as the result of natural processes. Additional soil loss would continue to occur on existing trails, roads, and ski area facilities throughout the upper Two Elk Creek basin. Also, as recreational use of trails in the area increased over time, so would soil erosion.

4.2.1.1.2.3 Hydrology

Water Quantity

Given that there would be no forest clearing associated with the Alternative A, no changes in storm event runoff or baseline water yield would occur. Consequently, the average annual water yield of the upper Two Elk Creek watershed would remain at the baseline value of approximately 8,600 acre-feet per year.

Water Quality

Under Alternative A, the only impacts to water quality would be those associated with existing sediment sources in the CAT II area including the access road to Sun Up Bowl, Sleepytime Road, and the base of Lift 21. Natural sediment production (172 tons), combined with sediment from existing disturbed areas (four tons) accounts for an estimated 176 tons of sediment delivered annually to Two Elk Creek in the upper basin. This amount would likely decrease over time as the base of Lift 21 becomes increasingly stabilized. The only additional human-caused hydrologic impacts associated with this alternative are those associated with summer through fall use of the Two Elk Trail.

Under the No Action Alternative, there would be no projected-related (human-caused) impacts to the water quality of Two Elk Creek originating from within the CAT III area. Impacts to water quality would however, continue to occur as a result of natural processes. Sediment delivered to Two Elk Creek may exceed baseline values due to rapid snowmelt and associated runoff, and intense rainfall events during periods with and without snow cover, and mass wasting.

4.2.1.1.3 Alternative B - Center Ridge

Among the three development alternatives, Alternative B would entail the least amount of ski trail, road, and facility construction. Consequently, it would also result in the fewest impacts to geologic, soil, and hydrologic resources (Figure 4.1).

4.2.1.1.3.1 Geological Hazards and Constraints

Construction of the Ridge and Super Bowl lifts and the grading and excavation required for ski trails, roads, and skiways would result in impacts to approximately 7 acres of land with geologic hazards. Most of the acreage involved is associated with DMA and RF hazard areas in Tea Cup Bowl. There would be no impact to any identified US or DSA areas as a result of implementing Alternative B. An additional 165 acres of land with geologic constraints (PUS) would be graded or excavated for conventional ski trails, skiways, and roads under this alternative. The acreage associated with these impacts is indicated in Table 4.1, while the location of facilities included under this alternative is depicted in Figure 4.1.

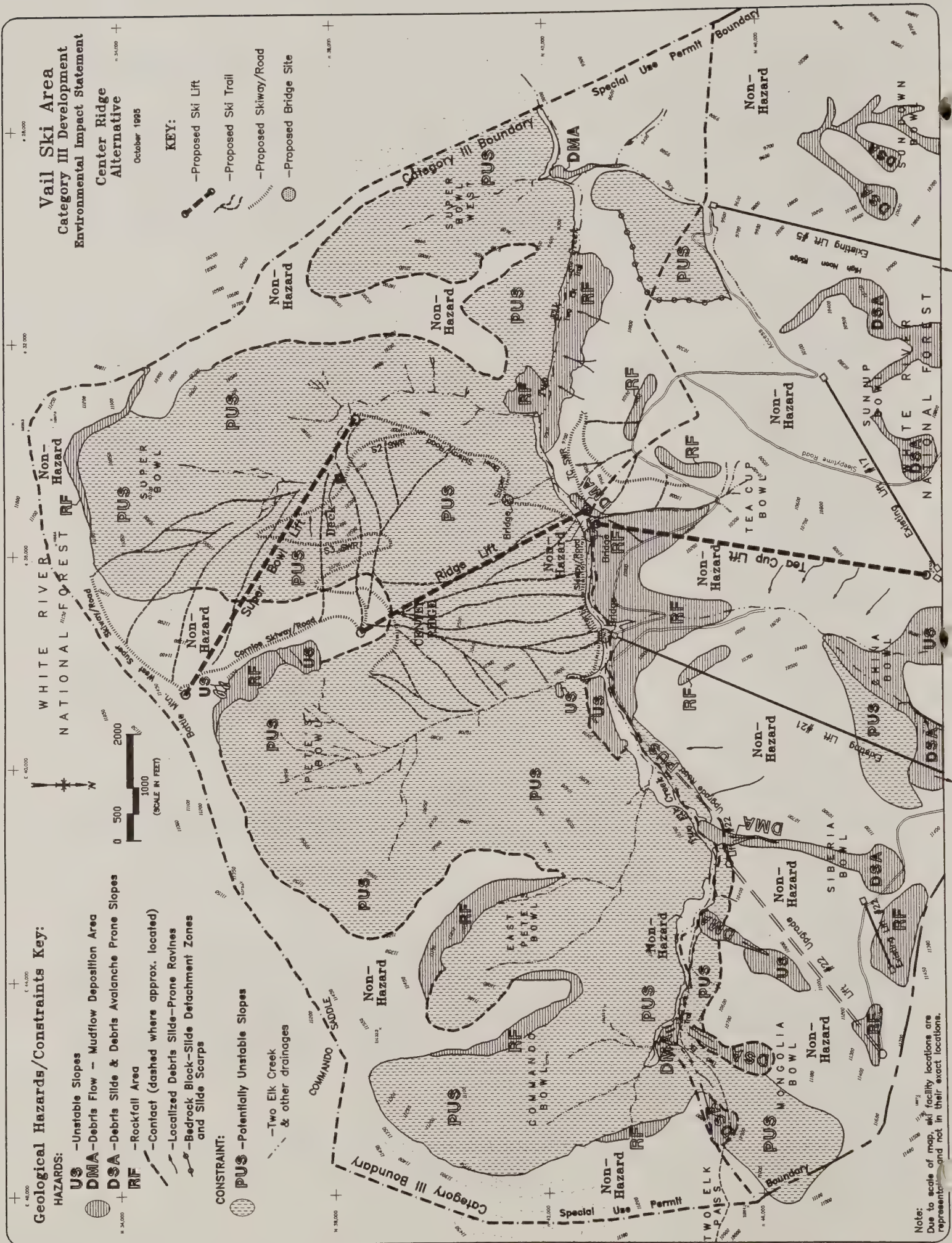


Figure 4.1. Location of the Center Ridge Alternative facilities relative to geological units.

4.2.1.1.3.2 Soils

Implementation of the Center Ridge Alternative would involve development of about 565 acres of skiable terrain, of which about 257 (45.5 percent) would be in naturally open areas. Approximately 225 acres of soils, or about 5.6 percent of the PA, would be graded or excavated for ski trails, skiways, roads, and other facilities under this alternative. Approximately 60 percent of the total soil impacts would occur in soil map units 517, 524, and 527 (Figure 4.2, Table 4.2). The Center Ridge Alternative would entail disturbances of approximately 7 acres to soils with severe erosion hazard and 13 acres to soils with severe limitations for revegetation. These soils are located mainly along the Tea Cup Bowl Lift alignment and on the east side of Super Bowl and in NCH3 and NCH5, respectively (Figure 4.2).

4.2.1.1.3.3 Hydrology

Refer to Figure 4.3 for the locations of all facilities proposed under this alternative relative to the upper Two Elk Creek watershed and the various sub-watersheds described in the Hydrology section of Chapter 3.

Water Quantity

Results of the water yield analysis indicate that the total water yield of the upper Two Elk Creek watershed under the Center Ridge Alternative would be about 8,648 acre-feet per year. Thus discharge would comprise an increase of approximately 48 acre-feet per year. Given that approximately 85 percent of this increase would be realized during the snowmelt runoff period (Oliver, *pers. comm.*, 1995), and assuming this period to be about 75 days, this results in a total flow increase of approximately 0.3 cfs. This increase is well within the natural variability of the existing flow regime and would not cause any changes in or impacts to the channel morphology or stability of Two Elk Creek. Moreover, results of the precipitation-runoff analysis indicate that development under the Center Ridge Alternative would have no effect on the runoff generated by a 10-year, 24-hour storm event.

Water Quality

Results of the PCDA analysis indicate that, under Alternative B, approximately 3.5 acres of ground would be graded within 100 feet of stream channels in the CAT III area (Figure 4.4). This estimate includes stream crossings such as the two bridges, a portion of the Intertie Skiway, and various conventional ski trails that are depicted as being within 100 feet of a stream channel such as trails 2H and 1B, respectively.

Results of the WRENSS model indicate that, under Alternative B, there could be about 670 tons of additional sediment delivered to Two Elk Creek over the first five years of the project. This amount represents about a 76 percent increase over the current, or no action, baseline sediment yield for the same time period. The majority of this sedimentation would occur during the second year with 295 tons (44 percent of the five-year total) delivered. Following year two, this amount declines rapidly through years three and four to about five tons in year five (Figure 4.5). The cause of this decline is due to the combination of decreasing construction activities and increasing revegetation of disturbed areas. As areas become more vegetated over time, the amount of sediment they produce decreases dramatically. From year five onward, sediment yield levels off and remains at approximately five tons per year. Studies indicate that sediment production in a disturbed watershed may approach, but does not usually return to pre-disturbance levels. Due to the flow regime and channel characteristics of Two Elk Creek, neither the short-term increases in sediment yield due to construction, nor the 5-ton increase in baseline sediment load would have a perceptible effect on channel stability.

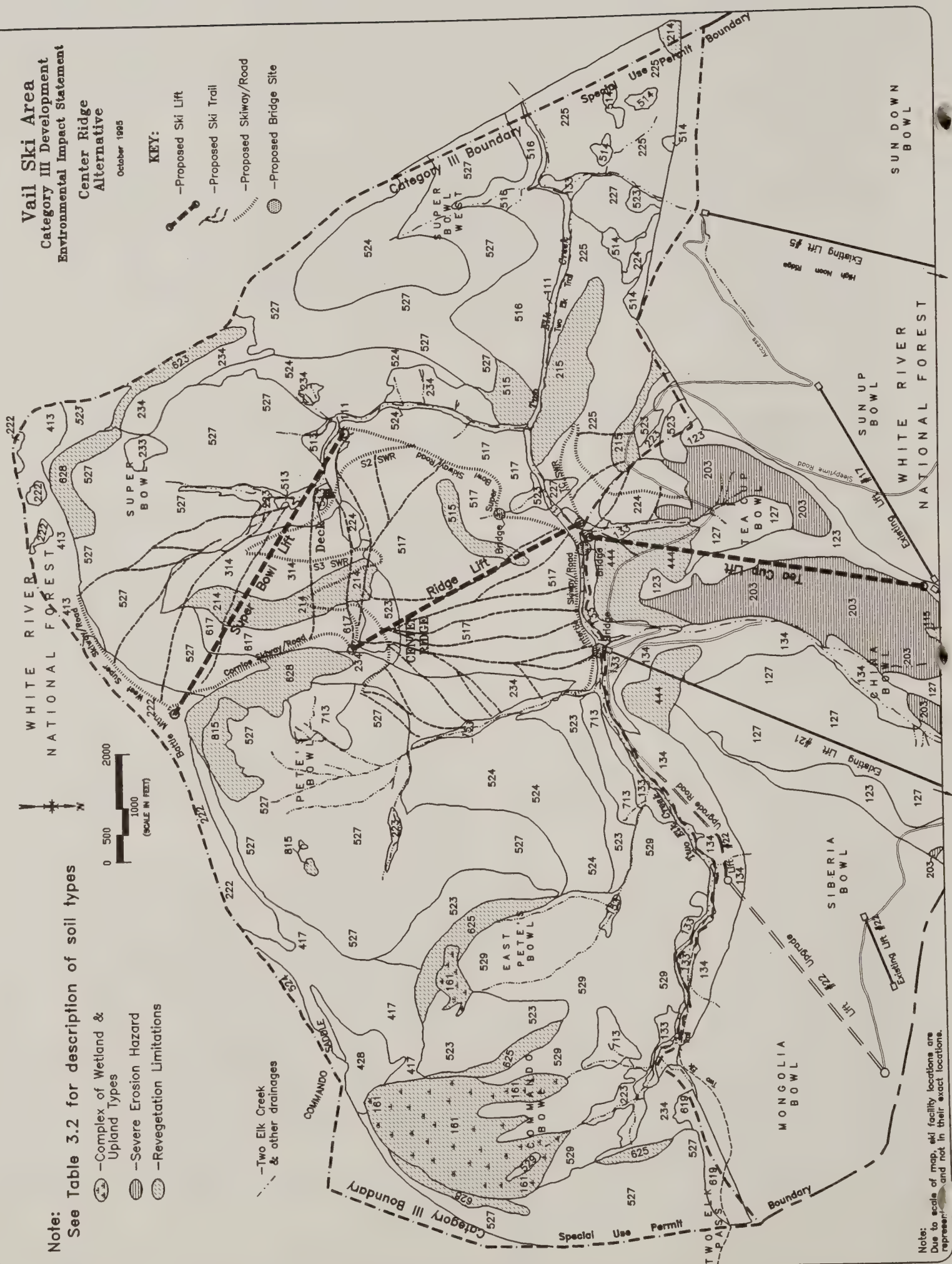


Figure 4.2. Location of the Center Ridge Alternative facilities relative to soil map units.

Note: Due to scale of map, ski facility locations are representative and not in their exact locations.

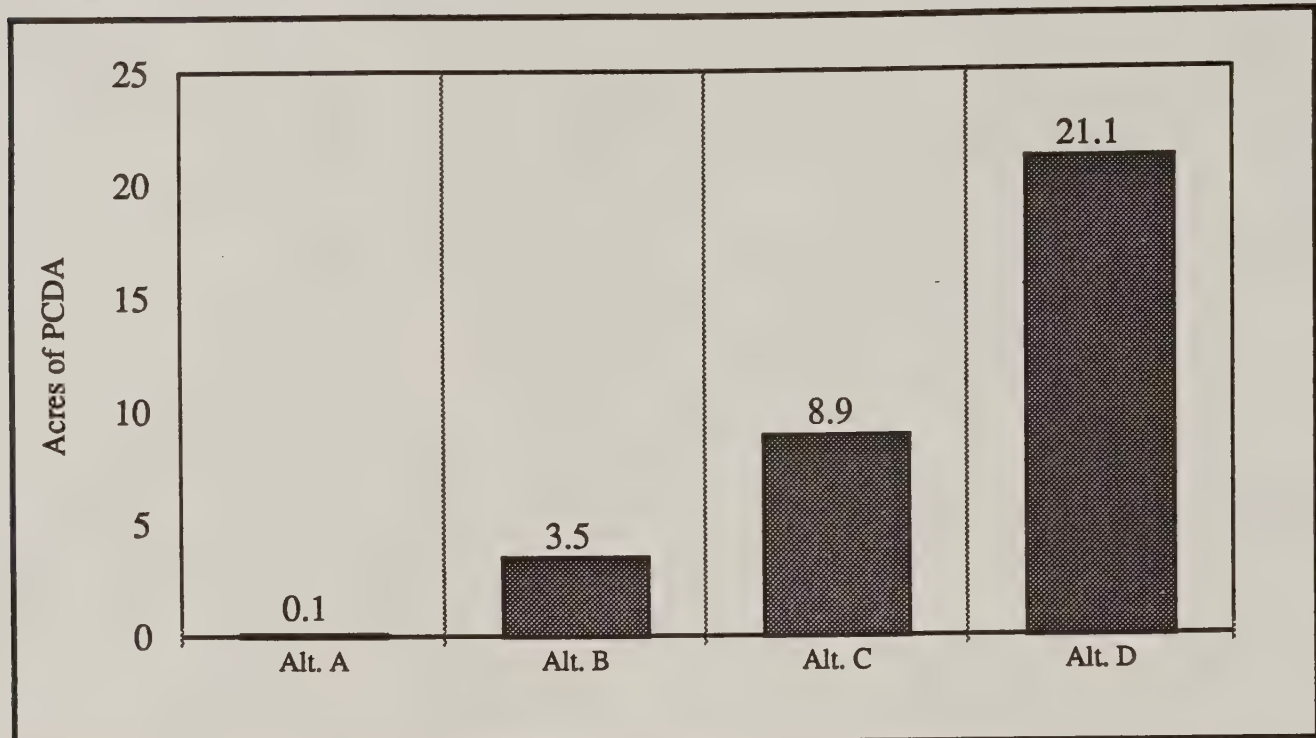


Figure 4.4. Acres of potential connected disturbed areas (PCDAs) under each of the alternatives.

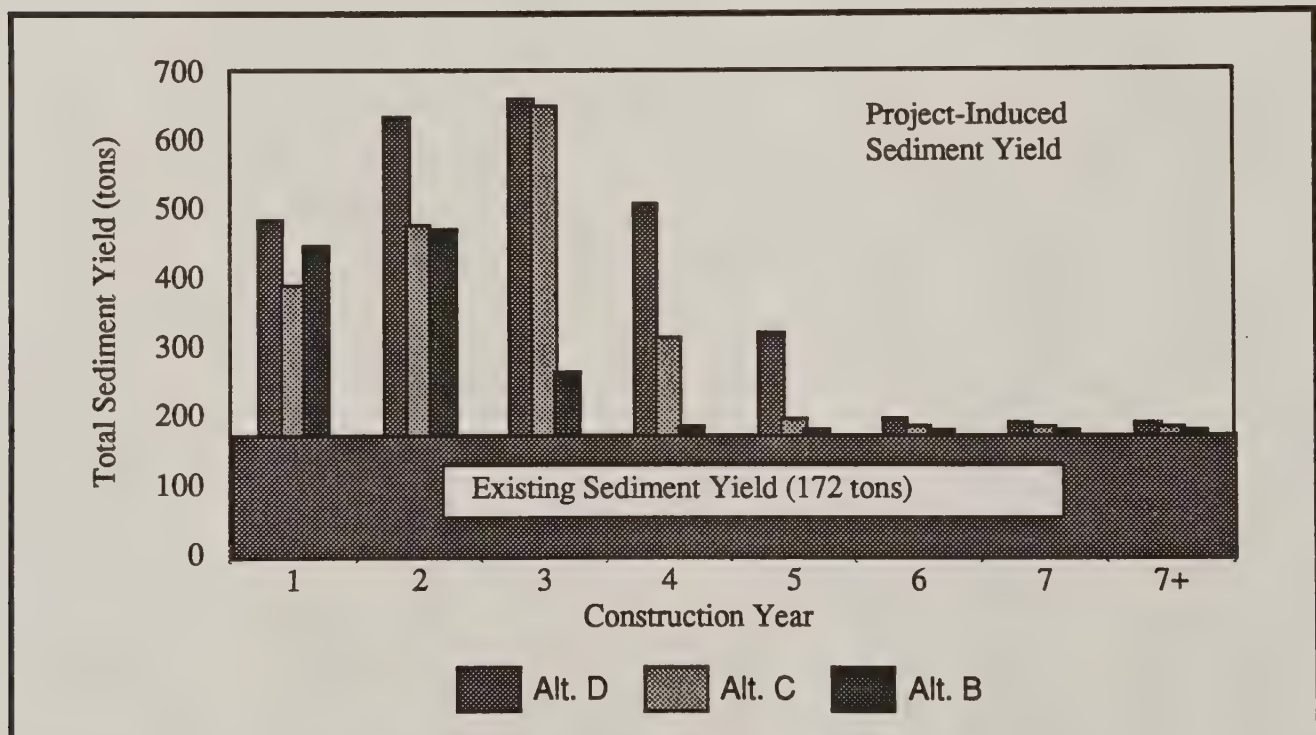


Figure 4.5. Relative sediment delivery (tons) by alternative using WRENSS modeling.

4.2.1.1.4 Alternative C - Proposed Action

Development under the Proposed Action would include the construction of ski trails, roads, and other facilities in Pete's Bowl and East Pete's Bowl in addition to those associated with the Center Ridge Alternative. Consequently, impacts to geology, soils, and hydrology of the PA are expected to be somewhat greater under this alternative relative to Alternative B.

4.2.1.1.4.1 Geological Hazards and Constraints

The developments associated with the Proposed Action would result in the grading or excavation of approximately 12 acres of land with identified geologic hazards. Most of the acreage involved is associated with DMA and RF hazard areas in Tea Cup Bowl. An additional 266 acres of grading or excavation would occur in geologic constraint (PUS) areas for the construction of conventional ski trails, skiways, and roads (Table 4.2). Refer to Figure 4.6 for the location of all facilities included under Alternative C in relation to geologic units.

The most important component of the above impacts is probably that associated with the construction of the Pete's Bowl Skiway/Road in the unstable slope area just east of the confluence of Pete's Bowl and Two Elk Creek. This area was mapped in the field as a young landslide which continues to exhibit signs of active soil creep (Goolsby Brothers and Associates 1993). Road construction in this area will probably require additional investigation to determine site-specific stability. Measures to ensure that water does not accumulate in the road prism will help to safeguard against potential mass movement in this area. These measures may be particularly important given that the proposed restaurant site lies just downslope of this area.

It is also important to note that, should construction of this road compromise the stability of the area, subsequent mass movement is only likely to occur during the spring and summer months when the ground is not frozen or protected by snowpack. Consequently, there would be little potential for threats to human safety given that public use of these facilities would be limited to the winter season.

4.2.1.1.4.2 Soils

The Proposed Action involves development of approximately 917 acres of skiable terrain, of which about 345 acres (37.6 percent) would be in naturally open areas. Grading and excavation for ski trails, skiways, roads, and other facilities would disturb about 422 acres, or about 9.8 percent of the PA, of soils under this alternative (Table 4.2). As in the Center Ridge Alternative, over one-half of the soil impacts would occur in soil map units 517, 524, and 527. Potential disturbances to soils with severe erosion hazard and revegetation limitations would be 11 and 23 acres, respectively. As described under the Center Ridge Alternative, these soils occur primarily along the Tea Cup Bowl Lift alignment and on the east side of Super Bowl and in NCH3 and NCH5, respectively (Figure 4.7).

4.2.1.1.4.3 Hydrology

Refer to Figure 4.8 for the locations of all facilities proposed under this alternative relative to the upper Two Elk Creek watershed and the various sub-watersheds.




October 1995

KEY:

- Proposed Ski Lift
- Proposed Ski Trail
- Proposed Skiway/Road
- Proposed Road
- Proposed Bridge

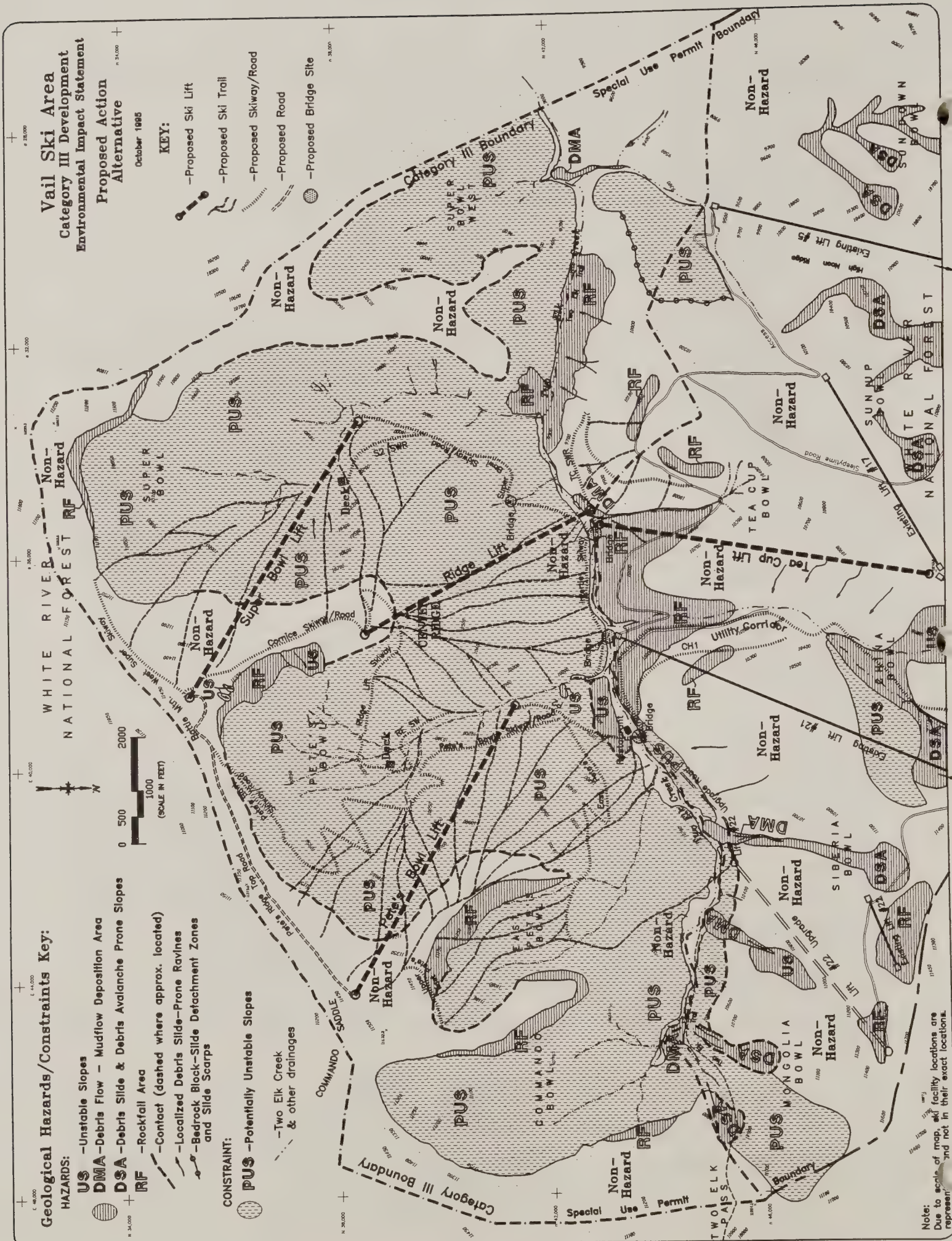
Geological Hazards/Constraints Key:

HAZARDS:

- US** -Unstable Slopes
DMA -Debris Flow - Mudflow Deposition Area
DSA -Debris Slide & Debris Avalanche Prone Slopes
RF -Rockfall Area
 -Contact (dashed where approx. located)
 -Localized Debris Slide-Prone Ravines
 -Bedrock Block-Slide Detachment Zones and Slide Scarps

CONSTRAINT:

- PUS** - Potentially Unstable Slopes
- Two Elk Creek
- & other drainages



Note:
Due to scale of map, all facility locations are
placed not to their exact locations.

Figure 4.6. Location of the Proposed Action Alternative facilities relative to geological units.

Figure 4.7. Location of the Proposed Action Alternative facilities relative to soil map units.

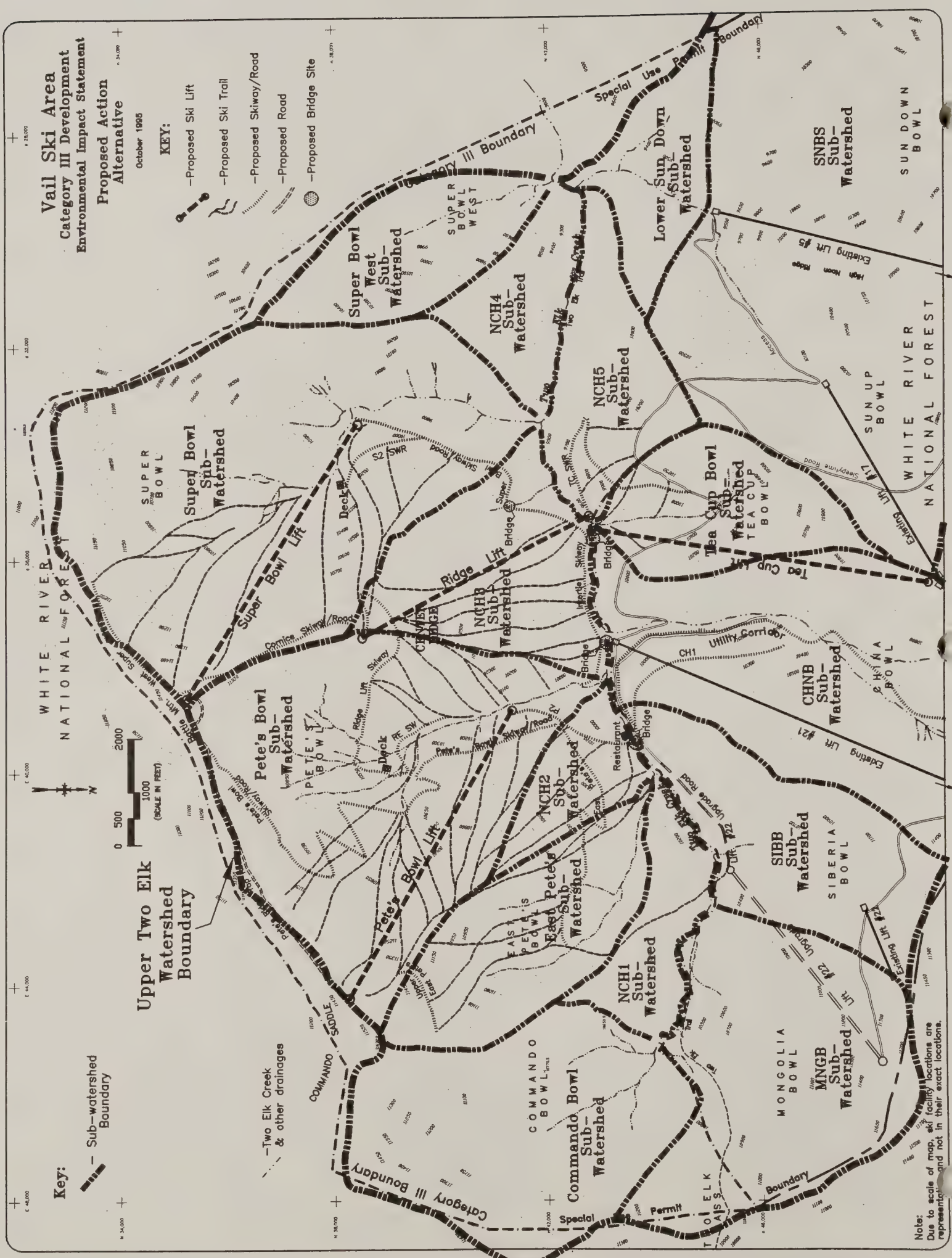


Figure 4.8. Location of the Proposed Action Alternative facilities relative to watersheds.

Water Quantity

Results of the water yield analysis indicate that the total water yield of the Upper Two Elk Creek watershed would be about 8,683 acre-feet per year under the Proposed Action. This discharge would comprise an increase of approximately 83 acre-feet per year over baseline. Given that approximately 85 percent of this increase would be realized during the snowmelt runoff period (Oliver, *pers. comm.*, 1995), and assuming this period to be about 75 days, this results in a total flow increase of approximately 0.6 cfs. This increase is well within the natural variability of the existing flow regime and would not cause perceptible changes in or impacts to the channel morphology or stability of Two Elk Creek.

Results of the precipitation-runoff analysis indicate that development under the Proposed Action would result in only minor increases in the runoff from Pete's Bowl and the upper Two Elk Creek watershed from a 10-year, 24-hour storm event (Pioneer 1995a). Runoff in Pete's Bowl would increase from zero to one cfs and runoff in Two Elk Creek at the CAT III area boundary would increase from 7 to 10 cfs. The average monthly snowmelt peak flow in Two Elk Creek is estimated to be approximately 64 cfs in June and the average monthly low flow approximately two cfs in December through March (Pioneer 1995a). Given this high annual fluctuation, a three cfs increase in a short-duration storm event would not be expected to have any substantive effects on the physical characteristics of Two Elk Creek.

Water Quality

Results of the PCDA analysis indicate that, under Alternative C, approximately 9 acres of ground would be graded within 100 feet of stream channels within the CAT III area (Figure 4.4). Over and above the PCDAs associated with Alternative B, this estimate includes an additional bridge, and portions of the restaurant site and Pete's Bowl Lift terminal that fall within the PCDA zone. A large portion of the increase in PCDA acreage associated with the Proposed Action over the Center Ridge Alternative is the extension of the Ridge Lift Skiway. This skiway makes seven stream crossings resulting in approximately 6.5 acres of additional PCDAs.

Results of the WRENSS model indicate that under Alternative C there could be up to 1,148 tons of sediment delivered to Two Elk Creek over the first five years of the project. This amount represents about a 130 percent increase over current or no action baseline sediment yields for the same time period. The majority of this sediment increase (474 tons or 41 percent) would occur largely as a result of the development of Pete's Bowl during the third year. Following the third year, this amount declines rapidly through years four and five to about 10 tons in year six and 9 tons in year seven (Figure 4.5). The cause of this decline is due to the combination of decreasing construction activities and increasing revegetation of impacted areas. From year seven onward, sediment yield levels off at about 9 tons per year under this alternative. Due to the flow regime and channel characteristics of Two Elk Creek, neither the short-term increases in sediment yield due to construction, nor the 9-ton increase in baseline sediment load would have a perceptible effect on channel stability.

4.2.1.1.5 Alternative D - MDP Alternative

Relative to the other alternatives, The MDP Alternative would involve the most extensive development of facilities within the CAT III area and would consequently entail the greatest potential impacts to geologic, soil, and hydrologic resources. Along with a system of ski trails, skiways, and roads, five lifts, including Commando, Super Bowl Long, Super Bowl West, Lower Sun Down, and Tea Cup Bowl, would be built under this alternative. It should be noted that all but the Tea Cup Lift are in different locations compared to the placement of lifts under Alternatives B and C.

4.2.1.1.5.1 Geological Hazards and Constraints

Under the MDP Alternative there would be a total of approximately 21 acres of impacts due to grading and excavation on lands with identified geological hazards. Most of the acreage involved is associated with DMA and RF hazard areas in Tea Cup Bowl, Lower Sun Down Bowl, Commando Bowl, and NCH1, NCH2, NCH4, and NCH5 areas. An additional 383 areas of grading or excavation would occur in geologic constraint (PUS) areas under this alternative for the construction of conventional ski trails, skiways, and roads (Table 4.2).

Just as under the Proposed Action, approximately 2 acres of unstable slopes (0.05 percent of the CAT III area) would be impacted as a result of road development in NCH2. Refer to Figure 4.9 for the location of all facilities proposed under Alternative D in relation to the geological hazard units described in Chapter 3.

A combined total of approximately 2 acres of debris flow-mudflow deposition areas (0.05 percent of the CAT III area) would be impacted in Commando Bowl, NCH4, Lower Sun Down, NCH5, and Tea Cup bowls. Impacts to Rock Fall areas under the MDP Alternative would total approximately 30 acres (0.7 percent of the CAT III area). The majority of these impacts (about 33 percent) would occur in Commando Bowl. The remainder would occur in East Pete's Bowl (about 25 percent), Tea Cup Bowl (21 percent), and NCH1, NCH4, and NCH5 (21 percent combined).

Just as under the Proposed Action, unstable slopes near the mouth of Pete's Bowl would be impacted due to the construction of the Pete's Bowl Skiway/Road through this area. Refer to the Geologic Hazards and Constraints section for a discussion regarding the potential ramifications of development in this area.

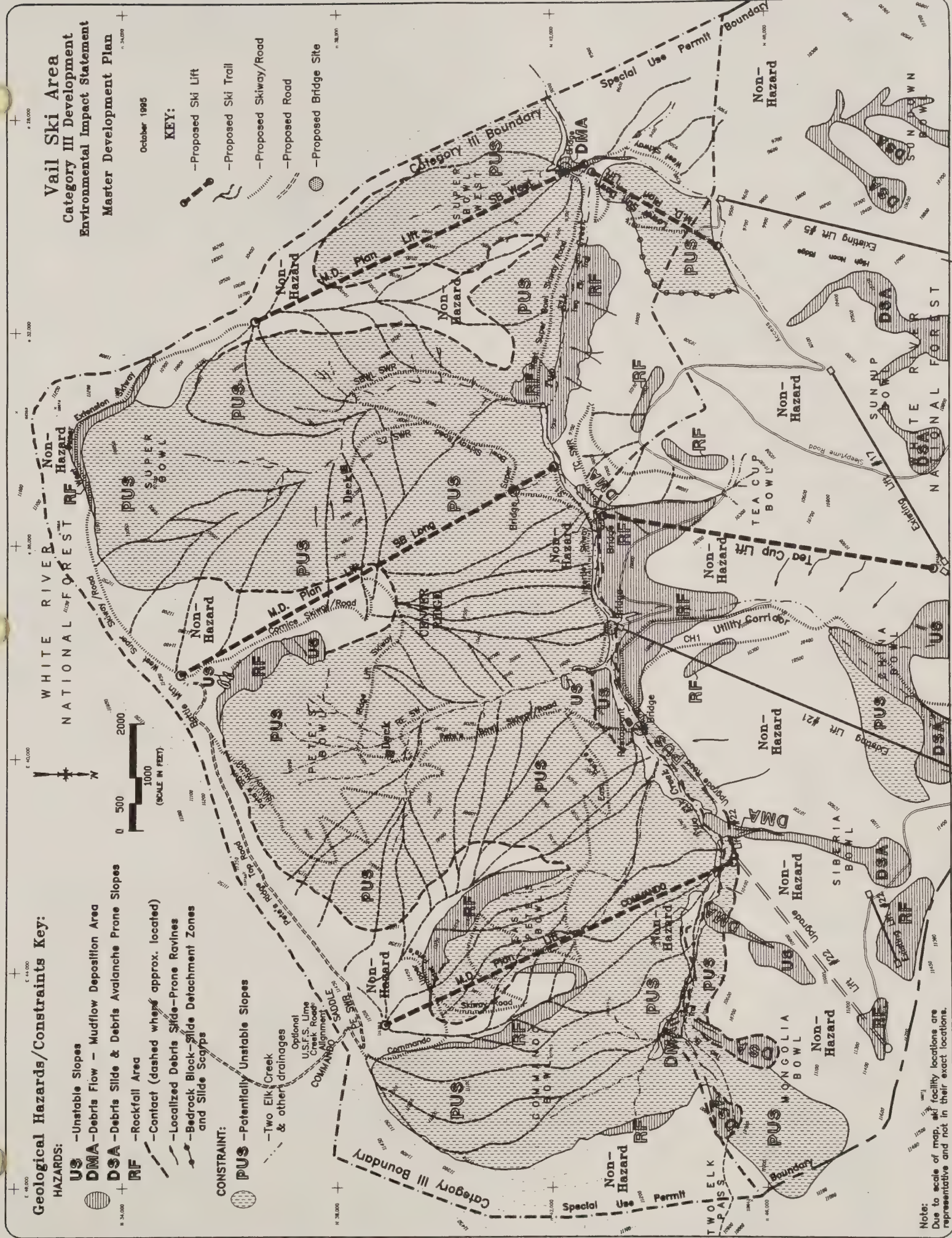
Under the MDP Alternative, the base of the Super Bowl West Lift, the bridge linking the skiway/roads on either side of Two Elk Creek in this area, and a portion of the Lower Sun Down Skiway itself, would be located within a DMA hazard unit. Consequently, there would be the potential for these facilities to be impacted by mud, boulders, and other debris during periods of exceptionally high runoff. Also, this area contains small zones with indications of slope instability. These zones exhibit evidence of rotational slumps and soil creep, especially where they occur near the confluence of the Super Bowl West drainage and Two Elk Creek. While proper engineering and the application of watershed mitigation measures could reduce the potential for impacts associated with geological hazards, the possibility for their occurrence should be recognized.

4.2.1.1.5.2 Soils

The MDP Alternative would offer about 1,254 acres of developed ski terrain. Of the skiable terrain, approximately 345 acres, or 27.5 percent, would occur in naturally open areas. A total of 647 acres, or about 15.1 percent of the PA, would be graded or excavated for ski trails, skiways, roads, and other facilities under this alternative (Table 4.2). Potential impacts to soils with severe erosion hazard and revegetation limitations would be 11 and 56 acres, respectively. In addition, this alternative would require extensive ski trail development in Commando Bowl which has a relatively large expanse of poorly drained soils likely to present both construction and revegetation difficulties (Figure 4.10).

4.2.1.1.5.3 Hydrology

Refer to Figure 4.11 for the locations of all facilities proposed under this alternative relative to upper Two Elk Creek watershed and the various sub-watersheds described in Chapter 3, Hydrology, Two Elk Creek Watershed.



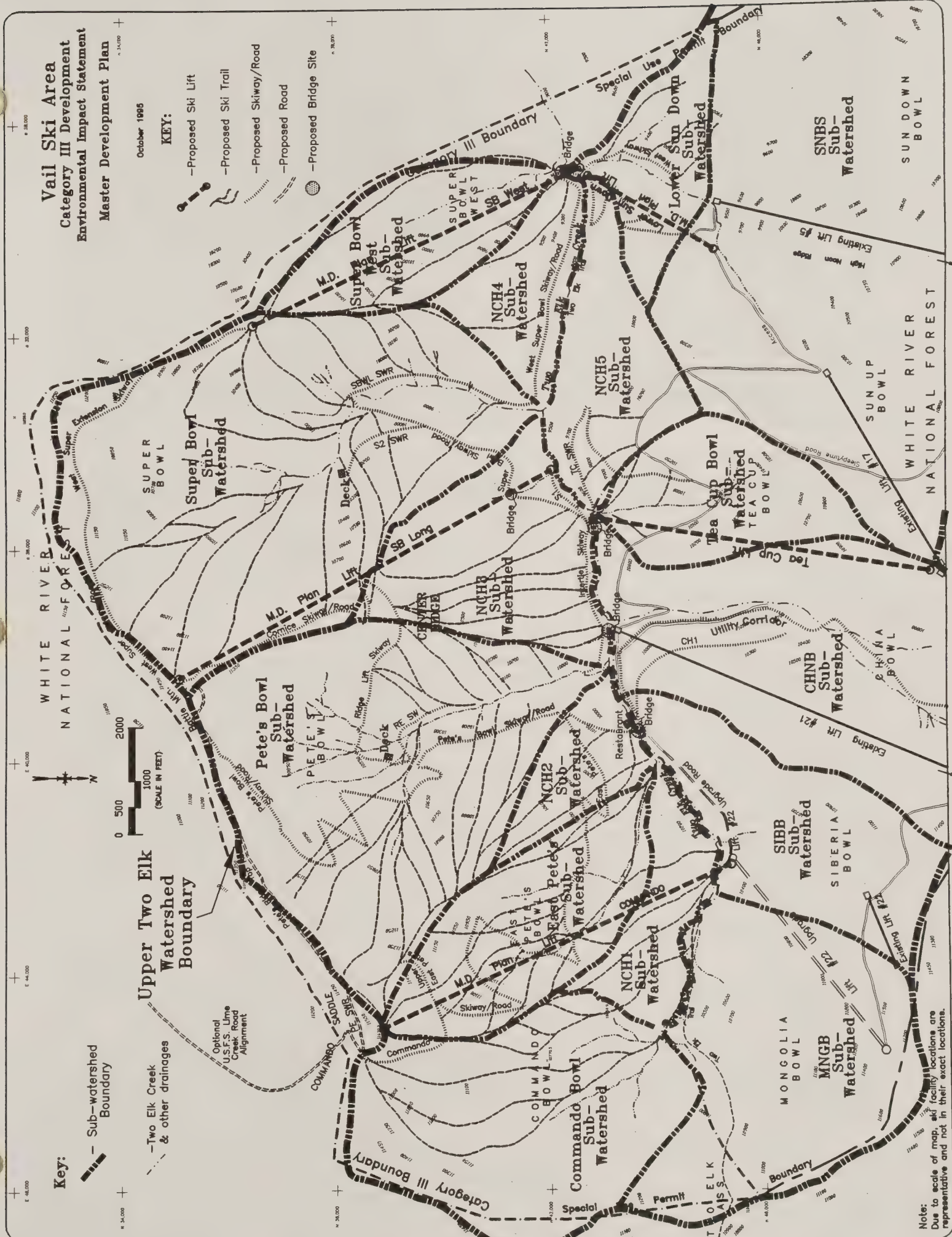


Figure 4.11. Location of the MDP Alternative facilities relative to watersheds.

Water Quantity

Results of the water yield analysis indicate that the total water yield of the Upper Two Elk watershed would be about 8,733 acre-feet per year. This discharge would comprise an increase over baseline of approximately 133 acre-feet per year. Given that approximately 85 percent of this increase would be realized during the snowmelt runoff period (Oliver, *pers. comm.*, 1995), and assuming this period to be about 75 days, this results in a total flow increase of approximately 0.9 cfs. Just as for the other action alternatives, this increase is well within the natural variability of the existing flow regime and would not cause any perceivable changes to channel morphology or stability of Two Elk Creek.

Results of the precipitation-runoff analysis indicate that development under the MDP Alternative would entail only minor increases in runoff from Pete's and East Pete's bowls and the upper Two Elk Creek watershed from a 10-year, 24-hour storm event (Pioneer 1995a). Runoff from Pete's and East Pete's bowls would increase from zero to one cfs each, and runoff in Two Elk Creek at the CAT III area boundary would increase from 7 to 11 cfs. Given Two Elk Creek's high annual fluctuation in streamflow, a 4 cfs increase from a short-duration storm event would be unlikely to have any substantive effects on the physical or biological characteristics of Two Elk Creek.

Water Quality

Results of the PCDA analysis indicate that under Alternative D approximately 21 acres of ground would be graded within 100 feet of stream channels within the CAT III area (Figure 4.4). Over and above the PCDA's associated with Alternatives B and C, this estimate includes an additional (fourth) bridge over Two Elk Creek, as well as portions of the Super Bowl West and Lower Sundown skiway/roads, portions of the Lower Sun Down, Super Bowl West, and Commando lift terminals, and ski trails within Commando Bowl that fall within the PCDA zone. The majority of increases to PCDA acreage under implementation of the MDP Alternative are those associated with additional skiway/roads.

Results of the WRENSS model indicate that under Alternative D there could be up to 1,730 tons of sediment delivered to Two Elk Creek over the first 5 years of the project. This represents about a 197 percent increase over current or no action baseline sediment yields for the same time period. The majority of this sediment increase (485 tons or 28 percent) would occur during the third year, largely as a result of the development of Pete's Bowl. Sediment yields in year four remain fairly high (332 tons or 19 percent) as a result of new developments in East Pete's and Commando bowls during this period. Following year four, sediment yield declines to 145 tons in year five and 21 tons in year six (Figure 4.5). As with the other alternatives, the cause of this decline is due to the combination of decreasing construction activities and increasing revegetation of impacted areas. From year seven onward, sediment yield levels off at about 15 tons per year under Alternative D. Due to the flow regime and channel characteristics of Two Elk Creek, neither the short-term increases in sediment yield due to construction nor the 15 ton increase in baseline sediment load would likely have a substantive effect on channel stability.

4.2.1.1.6 Optional Lime Creek Road Corridor

This facility is an element of the MDP Alternative but is discussed separately in order to clearly distinguish impacts associated with timber utilization from those strictly attributable to ski area development. Other resource impacts related to timber utilization are discussed in the Timber Resources section.

Approximately 5.3 acres of Scout and Leadville soils would be disturbed due to construction of the Lime Creek Road under this alternative. These soils present moderate limitations for construction and maintenance of unsurfaced roads, due mostly to steepness of slope, erosion hazard, and the potential for rutting. In addition,

these soils are rated as moderate in terms of their revegetation limitation, with the major limiting factors being low inherent soil fertility and, in the case of Scout soil, its more limited available water capacity. Construction of this road would involve crossing two small ephemeral streams and their associated channels.

Timber management and road construction activities on Scout and Leadville soils in the area surrounding Lime Creek are common and have revealed no unusual soils or slope stability hazards. Road construction on steeper slopes in these areas, especially those which are seasonally saturated, may encourage mass movement. Generally, mass movement in these cases tends to occur as road cut slope slumps rather than larger scale forms of slope failure.

4.2.1.2 Potential Mitigation Measures

A discussion of standard mitigation measures and potential mitigation measures that are project-specific for each resource are discussed in Chapter 2. Table 2.11 summarizes the major measures noting their effectiveness and the organizations responsible for authorizing and implementing them.

An extensive list of standard construction and operational practices is employed at Vail Ski Area to minimize adverse soil and water impacts. These practices have generally proven to be effective and would be employed under any action alternative selected. These mitigation measures are contained in the 2700 Appendix of Vail Associate's Summer Construction Plan (VA 1991a) and the Storm Water Management Plan for Vail Mountain (VA 1994b). The potential mitigation measures outlined below have been identified in response to possible impacts attributable to specific elements of the Proposed Action or alternatives to it.

Geology

A detailed geotechnical review of construction plans should be conducted for facilities located in DMA and RF hazard areas and roads constructed on the lower one-third of slopes in other areas, such as the lower section of Pete's Skiway/Road, the Intertie Skiway, Tea Cup Skiway/Road, and Super Bowl West Skiway/Road.

Soils and Hydrology

Because of its proximity to Two Elk Creek and the steepness of the slope on which it would be built, the Intertie Skiway would likely have the highest potential for contributing large amounts of sediment to Two Elk Creek. Consequently, relatively sophisticated mitigation measures would be required in order to minimize this potential. These measures may also be applied to relevant portions of other proposed roads or skiways close to Two Elk Creek such as the MDP Alternative's West Super Bowl and Lower Sun Down Skiway/Road. The following measures are recommended.

- ◆ Outslope the running surface of the skiway/road to provide a means of dispersing water in a low-energy flow from the road surface. A smooth surface must be maintained to ensure that water can drain across it without creating channels on the road surface.
- ◆ Where intermittent stream crossings occur, install culverts to convey streamflow to the other side of the road. In these areas, locating ditches at the base of the cut slope may be desirable for ensuring that water is conveyed through the culvert during high flow periods. If feasible, install culverts to conform to the natural stream bed and slope. Otherwise, place energy dissipators and/or armor at the outlet of the culvert to prevent erosion of the fill slope. The inlet should also be armored to minimize the potential for erosion during high flows.

- ◆ The profile of the cut slope should be concave. A concave slope has a relatively flat area at its base. The flatter slope allows for decreased erosion and increased deposition of sediments from the upper portions of the slope. Additionally, rounding off the upper edge of a concave slope minimizes the potential for water to undercut this edge and further reduces the potential for erosion.
- ◆ Both cut and fill slopes should be stabilized and reseeded using a combination of seed, straw and geotextiles such as jute fabric or other products of similar function. Geotextiles should overlap and be pinned or stapled to the slope on all sides.
- ◆ Sediment trapping structures should be placed at the base of the fill slope. These may include sediment basins and/or two rows of straw bales staked in place and lined on the uphill side with filter fence material.

Finally, while most potential mitigation efforts would likely be focused on areas adjacent to streams and channels, other possible measures could be undertaken in association with general trail construction work. For example, the amount of soil disturbed could be reduced by cutting stumps flush with the ground surface and not dozing the root mass out of the ground. In addition, approvals for subsequent phases of construction could be made conditional upon successful completion of revegetation of past disturbed areas.

4.2.1.3 Unavoidable Adverse Impacts

Provided that facilities are engineered to the proper specifications for given site conditions, there would be minimal unavoidable adverse impacts. Similarly, while some increases in stream sedimentation are likely to occur under the action alternatives, the amounts calculated using the Modified Universal Soil Loss Equation (Warrington et al. 1980) are likely to be overestimates given that they account for only minimal BMPs. Consequently, assuming VA continues to be successful in their revegetation efforts and uses the erosion control practices detailed in their Summer Operating Plan (VA 1994b) and Storm Water Management Plan (VA 1994c), soil loss and subsequent sedimentation, erosion hazard, and mass movement are likely to be minimal in most areas. Nevertheless, a certain amount of soil is likely to be redistributed within the sub-watersheds as a result of ski trail and road construction. This redistribution, while not necessarily contributing to stream sedimentation directly, may be deposited in small waterways and eventually make it into Two Elk Creek.

In reference to the action alternatives, the period during and immediately after construction of the Intertie Skiway and the bridges across Two Elk Creek would be the most likely time for soil loss and subsequent stream sedimentation of Two Elk Creek to occur. For example, if a large storm event were to occur during excavation of bridge footings or prior to full stabilization of the cut and fill slopes of the Intertie Skiway, potentially large amounts of sediment could be delivered to Two Elk Creek. Depending on the magnitude of the event, this could have severe, albeit most likely short-term, effects on water quality. Given the channel characteristics and flow regime of Two Elk Creek, the majority of sediment built up during the summer and fall would likely be scoured out during the following spring snowmelt period. Thus, over the long-term, manual stabilization and the eventual revegetation of these sites would most likely reduce soil loss and subsequent sedimentation to negligible levels.

4.2.1.4 Cumulative Effects

Relative to geological hazards, existing facilities such as Lift 21 and Sleepytime Road traverse a number of rockfall hazard units. In addition, Lift 21 crosses a potentially unstable slope and a debris slide, and an avalanche

prone slope toward the top of its alignment. Similarly, the future realignment of Lift 22 will cross a rockfall area at the upper end of the lift and the lower terminal will be located in an area of potentially unstable slopes. As noted above, given the application of standard mitigation measures and the fact that these facilities have been or will be engineered to account for geologic hazards, it is unlikely that any significant impacts would occur as a result of development in these areas.

Impacts to soils with high erosion potential and revegetation limitations are also likely to be associated with existing facilities and future, previously approved, developments within the Two Elk Creek watershed. The Sleepytime Skiway/Road and the lower portion of Lift 21 traverse soils in the Pinesile-Gateview complex (map unit 444) that have a severe erosion hazard rating and moderate revegetation limitation. Other soil units impacted by these facilities include two in the Gateview-Handran complex (types 133 and 134) having moderate erosion hazard and revegetation limitation. The realignment of Lift 22 will create additional impacts to soils within the Two Elk Creek watershed. However, provided the standard measures detailed in VA's Summer Operating Plan (VA 1994b) and Storm Water Management Plan (VA 1994c) are utilized, these impacts, even when combined with potential impacts from the CAT III area development, would not result in significant cumulative impacts to soil resources within the Two Elk Creek watershed.

In terms of cumulative impacts to water quantity, past forest clearing associated with the Sleepytime Skiway/Road, the Wow Trail, Commando Run Trail, Sun Up and Sun Down Catwalks, the High Noon Lift Line, and the access road to the base of Lift 17 may have led to increased minor water yields from the Back Bowls area. It should be noted, however, that any increases in water yield or precipitation runoff that may have resulted from these clearings or from the turn-of-the-century wildfire in the Back Bowls has been accounted for in the baseline water yield of 8,600 acre-feet/year calculated for the Upper Two Elk Creek watershed (Basin Hydrology 1995). Given the present stability of the Two Elk Creek stream channel and the relatively small increases in estimated streamflow associated with each of the action alternatives, there are unlikely to be significant cumulative effects to channel stability associated with the implementation of any one of these alternatives.

Past and present actions affecting water quality within the Two Elk Creek watershed are primarily those associated with the construction, use, and maintenance of the Sleepytime Skiway/Road and the base of Lift 21. Combined, these developments may contribute approximately of 4 tons of sediment to Two Elk Creek per year. The realignment of Lift 22 has the potential to contribute additional sediment to Two Elk Creek from the grading of its base terminal. However, given that this terminal would be located in a relatively flat area adjacent to a dense riparian willow complex, any resulting sedimentation would likely be minimal. Thus, with the sediment yields associated with the action alternatives, there is unlikely to be significant cumulative effects to water quality with the Two Elk Creek watershed.

4.2.2 AIR QUALITY

4.2.2.1 Direct and Indirect Impacts

The direct and indirect impacts to air quality under each of the alternatives, including that generated by timber and slash burning, is discussed below. Concern about the creation of greenhouse gases and global warming was expressed during scoping. Forest Service Policy (USDA-FS 1991b) notes that these issues are not within the scope of project-level NEPA reviews because, "... the USDA believes that the current state of global change information makes it impractical to use the information in project NEPA documents."

4.2.2.1.1 Alternative A - No Action

4.2.2.1.1.2 Ambient Air Quality

At the present time Vail does not exceed federal standards for any of the six criteria pollutants; therefore, it's categorization is attainment. Under all alternatives, however, including No Action, air quality could change from present conditions. The majority of these changes would be due to population increases in the Vail Valley, increased traffic on I-70 and other roadways, and alterations in emission types.

Emission Alterations

Presently, wood burning and road sanding collectively account for 96 percent of the TOV's total PM₁₀ contributions. In 1990, the TOV initiated a policy encouraging conversions of wood-burning units to gas. This policy, combined with the use of volcanic cinders for road sanding, has greatly decreased PM₁₀ concentrations in the area (Figure 4.12). Continuation of these policies would insure that population growth and/or increased skier visitation do not drive PM₁₀ levels beyond exceedance.

Population/Visitation Increases

To assess the effects of increased skier visitation on PM₁₀ and CO in the Vail area, Air Sciences, Inc. (1985) utilized a linked box model developed by Drs. Doug Fox and William Marlatt (Marlatt and Fox undated). The study area was divided into four areas or "boxes" of approximately equal size. The model assumed uniform wind-driven mixing of pollutants through each of these boxes. Model parameters required information on valley geometry, emissions, and meteorology as a function of time of day. Results show that under worst-case meteorological conditions an increase from 15,586 SAOT (peak day demand for 1985) to 18,070 SAOT (16 percent increase from 1985 peak day demand) would cause a relative increase of 2 to 7 percent in PM₁₀ concentrations and 3 to 5 percent in CO concentrations (results of the model are presented in Table 4.3). These predicted concentrations were much higher than actual concentrations observed at these respective SAOT's, however, the relative changes (percent change) in emission concentration are more important to this analysis than the absolute numbers. Additionally, the model was done in 1985 and could not account for current improvements in reducing wood burning emissions or road sanding practices. Even discounting these improvements, the relative percentages of change predicted by the model would not cause the Vail area to exceed, or even approach, the PM₁₀ standard.

Visibility

In spite of its attainment status, Vail has experienced problems with haze (TOV 1993). This could indicate that PM₁₀, while useful as a health standard, is not an effective visibility standard for inversion-prone mountain communities. Visibility is a measure of atmospheric transparency; consequently, it is most affected by particulates that effectively scatter light. Some of the particulate matter that affects visibility is greater than 10 µm in diameter. These large, airborne particles are not accounted for by PM₁₀ measurements. The wood burning policies adopted by the TOV (1993) and Eagle County (1990) have decreased the concentrations of large, airborne particulate matter as well as PM₁₀, thereby reducing haze. Continuation of the TOV's wood burning conversion program (TOV 1993) would likely decrease haze even further.

Effects on Wilderness

Visibility monitoring data show the Eagles Nest Wilderness experiences excellent visibility with a mean Standard Visual Range (SVR) of 200.6 km (± 1.68 km) and a 90 percent frequency of days with visibility between 92 and 345 km (Air Resource Specialists, Inc., 1993). This high visual range indicates that any haze problems currently experienced in the Vail area do not appear to affect surrounding wildernesses, nor would they affect surrounding wildernesses under the No Action Alternative.

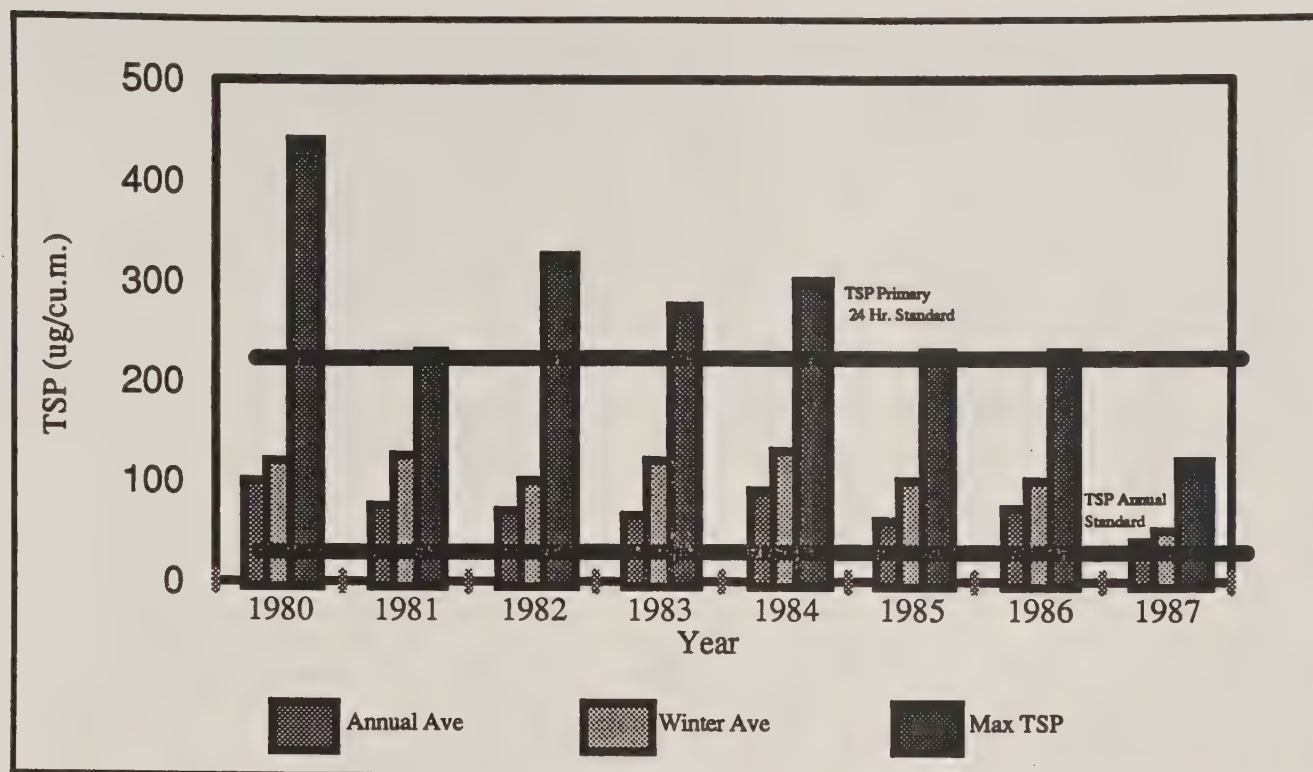


Figure 4.12a. TSP for Vail (TOV 1993)

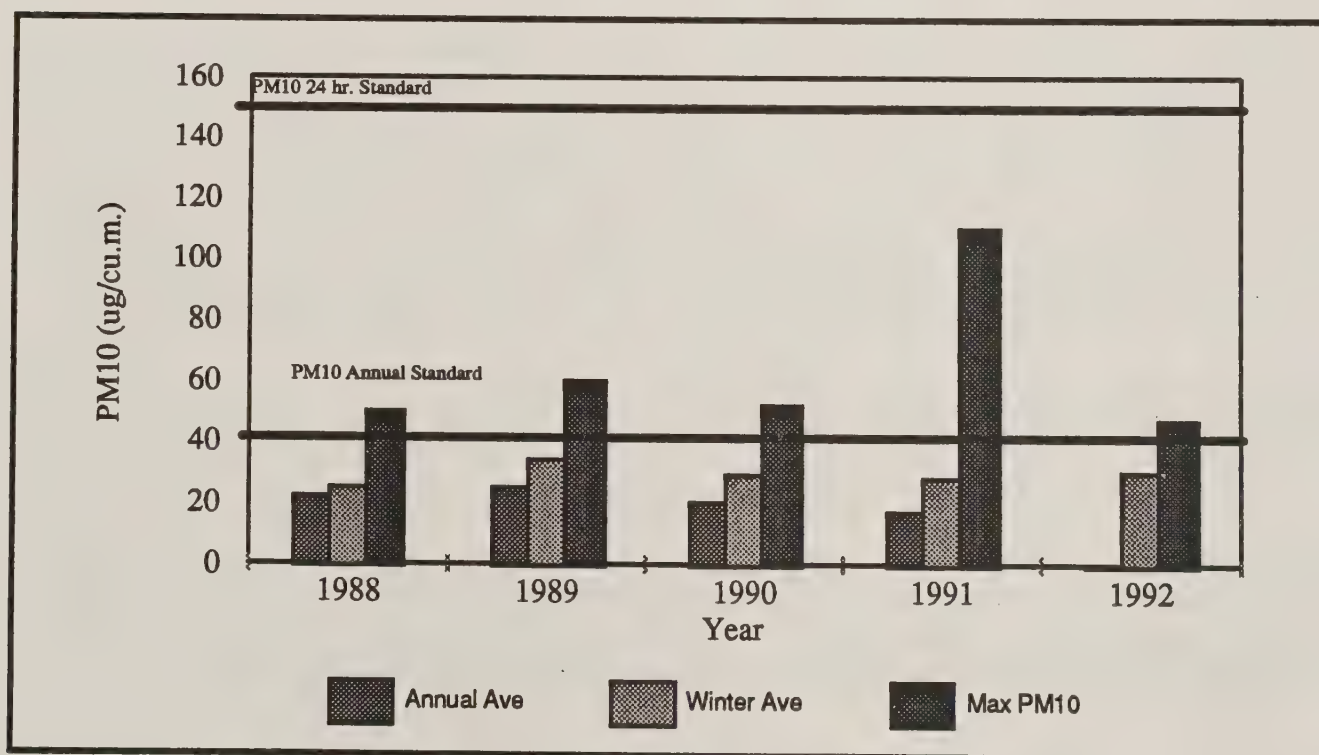
Figure 4.12b. PM₁₀ for Vail (TOV 1993)

Table 4.3. Highest Predicted Concentrations by Area (particulates as a 24-hour avg. in $\mu\text{g}/\text{m}^3$, CO as an 8-hour average in mg/m^3) (Adapted from Air Sciences, Inc., 1985)

Box	15,586 SAOT	18,070 SAOT	Percent Change
Bighorn			
TSP	181	187	+3
PM ₁₀	151	157	+4
CO	1.9	1.9	0
East Vail			
TSP	245	253	+3
PM ₁₀	211	217	+2
CO	3.7	3.4	-8
Vail Village			
TSP	443	460	+4
PM ₁₀	415	434	+5
CO	11.1	11.7	+5
West Vail			
TSP	524	556	+6
PM ₁₀	494	527	+7
CO	13.2	13.8	+5
TSP - Total Suspended Particles PM ₁₀ - particulate matter with an aerodynamic size equal or less than 10 microns CO - carbon monoxide			

4.2.2.1.2 Impacts Common To All Action Alternatives

Ambient Air Quality

As specified by the Agreement (Appendix A), none of the development alternatives for the CAT III area would increase peak-day skier numbers at Vail Ski Area. Therefore, since adverse impacts to ambient air quality would normally be associated primarily with increased peak-day numbers, these alternatives should not differ noticeably from Alternative A in this regard. These alternatives could result in different temporary impacts from the removal and disposal of timber to create ski trails. These impacts would vary in intensity by alternative and by timber harvest method. For example, emissions associated with timber burning would be reduced by hauling timber, but trucking would increase entrained dust. Therefore, either of these activities would have a short-term impact on air quality. The Timber Resources section describes the effects of timber harvest, for other resources.

A Simple Approach Smoke Estimation Model (SASEM) was used to predict emissions of various burning options for vegetation cleared by each alternative. Predicted amounts of PM₁₀ emitted are summarized in Figure 4.13. The model also predicts that these transitory emissions would result in temporary exceedances of PM₁₀ standards from 3 to 35 miles downwind of the burn site, depending on wind speed and other dispersal factors.

Effects of burning would be minimized through implementation of VA's Burning Plan. This plan specifies that before burn events are scheduled the following information would be obtained: 1) the burning index for the planned burning day, 2) forecasted weather, including possible frontal passages, winds and expected weather changes, and 3) the smoke dispersal forecast. Conditions which allow burning include:

- ◆ A burning index of 0 to 40 if weather and smoke dispersal Forecasts are favorable and hand tools and manpower are committed to the site. A burning index of 40 to 60 if a water truck and dozer is present at each burn location.
- ◆ No turbulent weather conditions are present or projected. These include frontal passages or jet streams moving over the burn area.
- ◆ The smoke dispersal forecast is in the good to fair category (VA 1995).

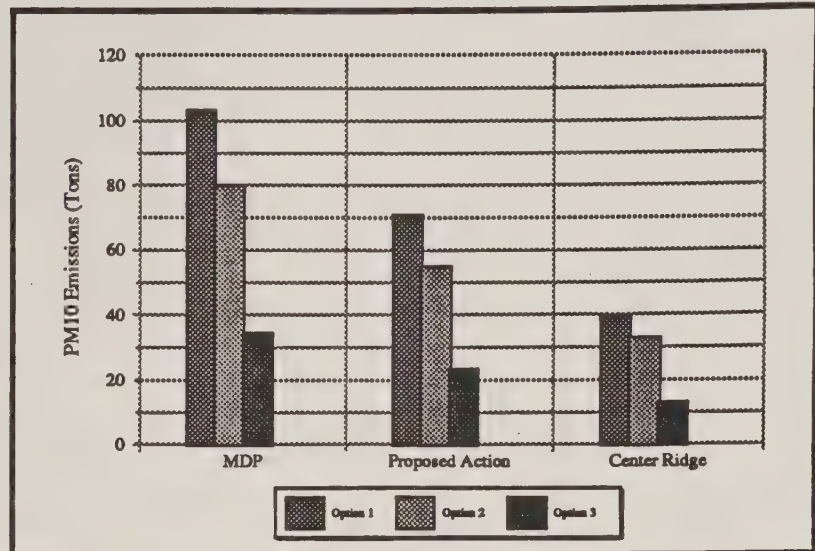


Figure 4.13. PM₁₀ emissions predicted by SASEM modeling.

Fugitive dust from construction and timber removal operations could also create temporary impacts to ambient air quality. Watering of areas where heavy equipment is operating may be required to alleviate this problem.

Visibility

SASEM model outputs indicate that timber and slash burning under each action alternative could have a temporary effect on visibility in the area around Vail. Effects on visibility could be limited by scheduling burn events during periods of high atmospheric dispersal.

Effects on Wilderness

Effects on Eagles Nest and Holy Cross wildernesses would consist of temporary decreases in visibility and would be identical to those noted above.

4.2.2.2 Potential Mitigation Measures

A discussion of standard mitigation measures and potential mitigation measures that are project specific for each resource are discussed in Chapter 2. Table 2.11 summarizes the major measures noting their effectiveness and the organizations responsible for authorizing and implementing them.

VA and the Forest Service, utilizing SASEM, can design burn events to minimize short-term air quality impacts. Methods that can be utilized to minimize emissions include:

- ◆ reducing the size of fuel loading to be burned each day,
- ◆ burning during favorable dispersion conditions,
- ◆ burning when the wind direction blows smoke away from sensitive receptors (i.e., wildernesses, scenic vistas),
- ◆ terminating burn events if meteorological conditions become unfavorable,

- ◆ burning material when it is seasoned and dry, and
- ◆ burning following wind direction analysis to avoid impacts to the Eagles Nest and Holy Cross wildernesses.

Eagle County and the TOV will continue their programs: (TOV 1993; Eagle County 1990) to reduce PM₁₀ emissions. Some of the objectives of these programs include:

- ◆ continuing to encourage voluntary conversion of wood-burning units to gas or other approved stoves;
- ◆ encouraging economic incentives through area retailers, financial institutions, and service companies to increase conversion of lodges and residents from wood-burning units to gas;
- ◆ monitoring new technology and programs focused on "clean" fireplaces;
- ◆ continuing to monitor air quality to determine possible relationships between air quality and number of guests, climatic conditions, time, and road sanding techniques;
- ◆ continued use of volcanic cinders, squeegee, or other alternative road applications;
- ◆ requiring EPA Type II appliances in new construction; and
- ◆ requiring construction sites and unsurfaced roadways to be watered as required to reduce fugitive dust.

4.2.2.3 Unavoidable Adverse Impacts

Some fugitive dust from construction and timber removal operations would be unavoidable. Otherwise, no unavoidable adverse impacts are anticipated.

4.2.2.4 Cumulative Effects

Under all action alternatives, timber harvest would be carried out concurrently with facility construction. The combination of burning emissions and entrained dust from vehicle traffic could substantially increase PM₁₀ levels in the Category III area. These impacts would be inversely related; more burning would equate to less logging truck traffic but would also generate more smoke. These impacts, however, would be short term, occurring only during construction periods. Future growth in Eagle County would increase related emissions in the Vail Valley.

4.2.3 NOISE

This section discusses the potential for unwanted sound to be caused by implementation of each of the alternatives. One of the more important potential sources of noise will be the various methods by which timber cleared for ski trails and other facilities might be harvested, and the route and method that might be employed in removing commercial timber from the area. The Timber Resources section discusses the potential resource impacts, including noise, associated with various timber harvest and transport options. This section discusses the potential noise impacts associated only with the most common harvest and timber disposal methods used at

Vail Ski Area. These include cutting trees with chainsaws, skidding logs and slash to central locations, and burning the material on site or hauling them to a sawmill.

4.2.3.1 Direct and Indirect Impacts

4.2.3.1.1 Alternative A - No Action

Under this alternative, the CAT III area would be subject to occasional, minor noise impacts as a result of maintenance of Lift 21 in the summer. In the winter, there would be noise associated with continuation of the avalanche control program and general skier use of the Back Bowls.

4.2.3.1.2 Impacts Common To All Action Alternatives

All action alternatives involve construction activity that would create noise. The intensity and duration of noise would generally be proportional to the scale of development associated with each of the alternatives. All alternatives involve use of heavy equipment such as trucks, dozers, and backhoes. Lift line towers would be installed using helicopters. Chainsaws would be used to fell trees, and skidders (tractors) would be used to transport logs to central points. Finally, excavations in rocky areas could involve the use of explosives. All of these construction activities would generate noise.

Winter noise impacts would include skier use of the CAT III area, grooming, snowmobile use, and avalanche control activities.

All of the action alternatives involve opening new terrain, a portion of which would be groomed periodically. Consequently, there could be some increase in snowcat traffic between storage/maintenance facilities and various mountain locations. Currently, this is a concern to residents along Forest Road, near the base of the ski area. Discussions are on-going to develop a means to address this situation, though as of yet no solution has been agreed to.

4.2.3.2 Cumulative Effects

Reasonably foreseeable future activities that could add to the direct and indirect effects of the CAT III area includes the upgrade and re-alignment of Lift 22, and continued maintenance of this lift and the existing Lifts 21 and 5. During winter, avalanche control and skier use of the Back Bowls would continue.

4.2.3.3 Unavoidable Adverse Impacts

Ski area development necessitates use of construction equipment and techniques which invariably create unwanted sound. Though of relatively short-term duration, these are unavoidable impacts associated with all of the action alternatives.

4.2.3.4 Potential Mitigation Measures

Potential mitigation measures identified are those which minimize public exposure to noise, versus diminishing the intensity or duration of the noise itself, since these are largely unavoidable impacts. The mitigation measures include:

- ◆ posing signs at trailheads and other points of entry to the Two Elk and Commando Run trails alerting summer users that construction activity should be anticipated;
- ◆ during periods of especially heavy construction, post and close portions of the Two Elk Trail to summer recreation use; and
- ◆ resolving noise issues related to snowcat traffic and grooming by altering routes or other means.

4.3 BIOLOGICAL ENVIRONMENT

4.3.1 AQUATIC BIOLOGY

4.3.1.1. Direct and Indirect Impacts

This section discusses direct and indirect impacts to macroinvertebrates and general fisheries in Two Elk Creek and the Eagle River. Additionally, potential impacts to threatened, endangered, and sensitive fishes are examined.

4.3.1.1.1 Impacts Common to All Action Alternatives

Implementation of any action alternative involves the construction of ski trails, skiways, roads, bridges and associated facilities. The alternatives differ primarily in the relative magnitude of these developments and their impacts on aquatic resources, with the Center Ridge Alternative having the least development (219 acres of graded and 226 acres of gladed disturbance), the Proposed Action somewhat more (389 acres graded and 445 acres gladed), and the MDP Alternative having the highest (617 acres graded and 713 acres gladed) development. Impacts to aquatic resources occurring as a result of these developments would mainly be due to sedimentation from construction. Correspondingly, a comparison of these impacts between alternatives is best made by evaluating the potential sediment deliveries for each alternative (see Hydrology section). Under all action alternatives, these impacts would be minimized through implementation guidelines outlined in the Summer Operating Plan and Stormwater Management Plan. A qualitative assessment of impacts for all action alternatives is given below.

4.3.1.1.1.1 Macroinvertebrates: Two Elk Creek and the Eagle River

Sedimentation of Two Elk Creek resulting from the proposed developments could have detrimental effects on invertebrate community diversity by decreasing the competitive abilities of species not tolerant to high sediment conditions. These effects could result in a fewer species of macroinvertebrates, although actual numbers of organisms may not decrease.

Construction-induced erosion would generally be contained by application of sediment traps, filter fences and other standard operating procedures. Additionally, natural vegetation, existing beaver dams, and check dams located along the stream would tend to trap sediments. Consequently, the Eagle River would be expected to receive very little sediment input from Two Elk Creek and project impacts to macroinvertebrates in the Eagle River would likely be negligible.

4.3.1.1.1.2 General Fisheries: Two Elk Creek and the Eagle River

Sedimentation in Two Elk Creek could impact stream water quality as well as brook trout spawning habitat. Because the stream is small, heavy equipment disturbance would be especially detrimental, particularly if it occurs during brook trout spawning periods (October through December), though this is not a common practice. Sediment dislodged by construction activities during the spawn would cover spawning gravel, subsequently decreasing available spawning habitat as well as destroying eggs and larvae. These short-term disturbances could decrease trout recruitment for a period of 1-2 years. The clearing of ski trails and lift alignments associated with proposed lifts would also elevate soil erosion, with resultant increases in sedimentation into Two Elk Creek. The Intertie Skiway, in particular, has the potential for substantial sediment inputs due to its proximity to the stream.

Only essential clearing would be done at the base of proposed lifts, therefore it is unlikely that they would affect significant amounts of riparian habitat. The construction and maintenance of the Intertie Skiway, however, has the potential for impacting riparian vegetation. Generally, the loss of a streamside vegetation buffer removes cover for resident fish, increases siltation and nutrient input, and causes water temperature elevations due to loss of shade. However, except for areas adjacent to bridges, the Intertie Skiway and all other facilities would be located at least 50 feet from Two Elk Creek, therefore they should not substantially affect the bank vegetation which provides cover and shade for resident fish. Consequently, project impacts to water temperature and water chemistry would be minimal.

Indirect foodweb effects from impacts to water quality (i.e., increased siltation and water temperatures) could decrease brook trout individual and population health. This could take place through invertebrate community shifts which would affect the brook trout prey base. However, existing localized point sources of sedimentation in Two Elk Creek, while affecting invertebrate community structure, do not appear to have affected the brook trout population (W. J. Miller and Associates 1993). Additionally, the presence of natural sediment dams (such as beaver ponds), combined with the implementation of proposed mitigation measures, would continue to confine siltation to small localized areas, thereby preventing significant effects to trout populations.

The small scale of disturbance experienced under these alternatives would preclude any significant effects to general fisheries in the Eagle River.

4.3.1.1.1.3 Threatened, Endangered, and Sensitive Fishes

Two Elk Creek and the Eagle River

No known threatened, endangered, or Forest Sensitive species occur in Two Elk Creek, although the Colorado River cutthroat trout (a Forest Sensitive species) inhabits portions of the Eagle River. However, none of the alternatives would have substantial effects on water quality in the Eagle River, and therefore would not impact resident cutthroat trout.

Colorado River

Four endangered fish species including the Colorado squawfish, humpback chub, bonytail, and razorback sucker, inhabit the Colorado River. Because the PA is located approximately 150 miles upstream from populations of these four endangered species, it is doubtful that project-induced impacts to water quality would affect them. No alternative would result in an increase in snowmaking or use of municipal water above the depletion level established in the 1986 Biological Opinion (Ruesink per. comm. 1986) issued in conjunction with the 1986 BA. Consequently, none of the alternatives would impact threatened, endangered, and Forest sensitive fishes. Refer to the Aquatic Biology section in Chapter 3 for a full discussion of Section 7 Consultation under the ESA (1973,

as amended) relative to potential impacts to threatened and endangered fishes associated with the proposed project.

4.3.1.1.2 Alternative A No Action

4.3.1.1.2.1 Two Elk Creek and the Eagle River

Under this alternative, Two Elk Creek and the Eagle River would not experience significant changes except those related to natural events or current human activities in the CAT III area.

4.3.1.2 Potential Mitigation Measures

A discussion of standard mitigation measures as well as potential mitigation measures that are project-specific for each resource is contained in Chapter 2. Table 2.11 summarizes the major measures noting their effectiveness and the organizations responsible for authorizing and implementing them. A complete outline of mitigation measures for aquatic resources is reviewed below.

Strategies to mitigate for short-term disturbance include:

- 1) A prohibition on construction in the vicinity of Two Elk Creek from October 1 to May 1 each year, unless specifically approved by the Forest Service in a separate operations plan which provides adequate protection to the creek.
- 2) The use of sediment fences, mulch, and/or erosions mats during construction at locations stipulated by the Forest Service.
- 3) The planned minimization of streambank and streambed disturbance and avoidance of sensitive riparian sites. Special care would be utilized during construction of the Intertie skiway to insure that heavy equipment does not disturb vegetation directly adjacent to the stream and that sufficient silt fencing is properly installed prior to any ground disturbing activity associated with construction near Two Elk Creek.
- 4) The revegetation any area near a stream as soon as it is practical, even if the work must be done out of sequence with other revegetation efforts.
- 5) Adherence to measures presented in the draft Watershed Conservation Practices Handbook for the Rocky Mountain Region (USDA-FS 1995).

Long-term mitigation measures include the BMPs found in VA's normal construction and operations plans, their Storm Water Management Plan, various Forest Service regulatory guides (such as item #5 above), and other requirements imposed through the SUP. Examples of some of the types of measures for long-term mitigation are noted below.

- 1) Utilization of appropriate mulch on disturbed areas after construction and before completion of revegetation, particularly in areas adjacent to Two Elk Creek such as the Intertie skiway and lift terminals.

- 2) Successful revegetation of cleared ski trails, lift alignments, skiways, as well as the cut-and-fill slopes of skiways and roads.
- 3) Maintenance of structures or devices such as culverts and sediment basins in a functioning condition. In order to be effective, sediment basins would need to be maintained in a fully functioning condition for at least 3 to 5 years or longer if monitoring detects a problem.

Both long- and short-term erosion mitigation measures would prevent significant sedimentation from entering Two Elk Creek.

4.3.1.3 Unavoidable Adverse Impacts

The addition of some sediment into Two Elk Creek from project implementation is inevitable. However, the use of erosion control practices outlined in the above mitigation measures, combined with the presence of natural sediment dams in Two Elk Creek, would result in most impacts being minimized or avoided. Minimizing sedimentation of Two Elk Creek is critical for maintaining the healthy ecosystem required by trout and other organisms currently found in the creek.

4.3.1.4 Cumulative Impacts

4.3.1.4.1 Two Elk Creek

Increased recreational traffic, unrelated to ski area development, along the Two Elk Creek corridor could degrade streamside vegetation and streambank integrity. The loss of cover and water quality associated with these impacts would have adverse long-term effects on fishery habitat.

4.3.1.4.2 Eagle River and Tributaries

Rapid residential and commercial growth in the Vail Valley are creating additional demands for municipal water and sewage treatment as well as increasing urban runoff. This growth is expected to continue. Employees associated with operation of the CAT III area would add cumulatively to this condition, though at a relatively minor level.

4.3.1.4.3 Colorado River

The increased municipal water use mentioned above would take water from tributaries of the Colorado River, however, virtually all of that water would be returned in a short time period. This, and the absence of increased snowmaking in the CAT III Area, indicate that project implementation would not contribute to cumulative water depletions affecting the Colorado River, except for those which have been considered in earlier disclosures. Those depletions considered in earlier disclosures include water needed for development of the CAT III area (restaurant and sewage), which was considered in the 1986 EA and accounted for under water depletion planning processes.

4.3.2 VEGETATION

4.3.2.1 Direct and Indirect Impacts

This section describes potential impacts to the vegetation within the PA resulting from disturbance to the existing habitat types presented in Chapter 3 of this document. Similar to its treatment in Chapter 3, wetland vegetation impacts are covered partially in this section, with additional detail presented in the wetlands section of this chapter. Impacts specific to each alternative are discussed following those impacts common to all alternatives.

4.3.2.1.1 Impacts Common to all Action Alternatives

4.3.2.1.1.1 General Vegetation

Impacts to vegetation may result as a consequence of implementation of any of the alternatives. These impacts could occur from a variety of construction activities, including building lift terminals, towers, and lines; establishment of ski runs, glades, and skiways; construction of support facilities such as restaurants, decks, and patrol buildings; and, associated access roads, bridges, and utility lines. Direct impacts to vegetation from the development of the proposed development include the removal of vegetation, blading, slope recontouring, glading (thinning of up to one-third of the trees), and revegetating specific areas to accommodate ski trails and skiways. Some naturally open (non-forested) areas would not require blade work (such as the naturally-occurring meadows in portions of both Super and Pete's bowls or on talus slopes), and therefore impacts would be only those associated with being skied over. Given appropriate snow cover, this activity should pose no detrimental effects to the vegetation. Other areas would be cleared of trees or gladed. Understory vegetation in these areas would not be cleared, but portions of the gladed area would potentially be affected by trampling from heavy equipment, or perhaps more importantly, log skidding activities resulting from timber removal.

Additional impacts to vegetation may result due to relatively small-scale changes that would accrue over time. For example, changes to various vegetation communities could result from changes in the snowmelt regime due to increased snow compaction or from alterations in the summer grazing patterns of displaced wildlife species or livestock. Further, expanded avalanche control on new ski trails has the potential to affect vegetation by causing changes in seral vegetation patterns in areas that have traditionally remained treeless due to regular avalanche events. Although an increase in summer recreation is not part of VA's proposal, it could possibly occur as a result of new access to the area. If more summer recreation occurs, then some of the vegetation along streams and trails could be adversely affected.

Aside from the vegetation directly removed, additional effects to understory vegetation may occur during glading, as up to one-third of the forest canopy cover may be removed. For instance, the understory vegetation, particularly in dense spruce-fir forests, would be impacted by increased competition from plants that thrive in more open conditions. Understory species adapted for low light conditions would likely be out-competed by plant species which either require or tolerate greater light levels. The shade-tolerant species may eventually be eliminated from these gladed areas because of the change in microhabitat. Several uncommon understory plant species (including some orchids) could potentially be affected by proposed glading activities under the various alternatives.

Several overall indirect changes to the forest within the PA could be expected as a result of the vegetation removal anticipated from the proposed development. In particular, a slight local increase in water yield could result, as less water would be utilized or evapotranspired from areas cleared of vegetation. This effect, however, would

likely be measurable only at the micro-scale level (see the Hydrology section for details on water yield). Until any disturbed areas are fully revegetated there would be a potential increase in siltation and erosion, particularly into stream systems where extensive clearing of the surrounding areas would occur. Peak spring runoff flows could potentially be higher, as the snowpack would melt more quickly in areas with a reduced forest canopy cover. This condition may be exacerbated in conventional ski trail construction areas by a decrease in snowmelt-water retention capabilities normally provided by the vegetation present; correspondingly, areas could become drier later in the season as water previously held in vegetation is no longer available.

Access skiway/roads and underground utility lines would be constructed for each lift. Ground disturbance would be confined to existing and proposed ski facilities wherever possible. Additional impacts to vegetation could result from erosion caused by constructing skidding and hauling roads throughout cleared areas. These roads have been identified as the major contributor to erosion problems in many logged forest stands.

Direct and indirect effects to vegetation would result as the native flora of the disturbed areas would be predominantly replaced by seeded plant species used in the revegetation program, although some natural regrowth could also be expected. Conversion of the vegetation currently found in these areas would likely result in a decrease in both overall native plant species diversity and habitat type diversity. The disturbance associated with clearing established vegetation and construction operations would potentially result in increased populations of noxious weeds (such as toadflax) already present on the ski area, as these activities leave the disturbed areas open to weedy invasions. Weedy species can effectively compete with and eventually dominate the more desirable native plant species.

Implementation of the standard mitigation measures would effectively reduce adverse impacts to vegetation but there would still be an overall loss in vegetation cover (particularly forest canopy cover) and species diversity. However, the acreage of some vegetation types, particularly open and "edge" vegetation types would increase. Phased construction of the proposed developments would slow the rate of vegetation type conversion and reduce the area of disturbance at any given time. This phased approach would allow incremental establishment of revegetation efforts, thereby reducing potential related impacts such as increased sedimentation and erosion. The general approach to mitigation would be the same for each alternative; however, due to the scope or intensity of various proposed development activities, some disturbances would require more intensive or larger scale mitigation efforts than others.

In general, areas that are cleared and graded would be converted from the existing vegetation type to seeded ski trail vegetation. Gladed areas would be converted to a more open type of forest stand, but would often retain enough native flora components that these areas would not necessarily need to be reseeded as portions of the vegetation would likely recover through natural regrowth. Much of the area in Super Bowl and large tracts of Pete's Bowl are naturally open enough to be skied in their current condition with no additional disturbance to these slopes; impacts to these areas from ski area development would essentially be negligible. A summary of the acreage of vegetation types that would be disturbed by building ski trails, lifts, and other facilities for each alternative is presented in Table 4.4. A more detailed form of this table, aggregated by bowl, is presented in Appendix B, Table 2. Disturbance to vegetation resulting from proposed roads and skiways under the different alternatives is detailed in Table 3, Appendix B. Calculation of the affected acreage is based on overlaying the proposed facilities for a given alternative on a base map using a Geographic Information System (ArcInfo) to generate the results by computer. The results of this application are used to compare the relative differences in vegetation impacts among the action alternatives, rather than determining skiable acreage or some other type of impact.

Table 4.4. Vegetation disturbance by type for each action alternative

Center Ridge: Alternative B								
Vegetation Type	Acres in PA	Trails			Lifts	Utilities Skiway/Roads Buildings	Acres Affected	Percent Type Affected
		Open ¹	Conven	Gladed				
Grassland/Meadow (GM)	907	43	22	10	11	15	101	11%
Aspen (AS)	200	0	11	6	3	1	21	9%
Aspen/Conifer (AC)	219	0	13	11	0.46	6	31	15%
Lodgepole Savannah (LS)	102	9	4	1	1	4	18	18%
Lodgepole Forest (LP)	892	0	58	95	2	15	170	19%
Willow Riparian (WR)	76	0	0	0.35	0.10	1	1	2%
Mixed Spruce-fir/Lodgepole Forest (MF)	34	0	0	0	0	0	0	0%
Mountain Brush (MB)	488	0	5	1	0	0	7	1%
Spruce-fir (Old-growth)	697	0	12	27	1	2	42	6%
Spruce-fir (SF)	332	0	5	6	2	1	14	4%
Spruce-fir Savannah (SS)	223	6	2	4	0.01	0	13	6%
Mixed Savannah (MS)	85	0	13	13	0.48	0.39	26	31%
Special Aquatic Site (SAS)	1	0	0	0	0	0	0	0%
Rock/Scree (SC)	44	0	0	0	0	0	0	0%
TOTALS	4300	58	145	175	21	45	445	10%
Proposed Action: Alternative C								
Grassland/Meadow (GM)	907	79	22	18	12	13	144	16%
Aspen (AS)	200	0	15	9	0.46	6	31	15%
Aspen/Conifer (AC)	219	0	15	11	4	3	33	15%
Lodgepole Savannah (LS)	102	9	4	2	1	1	16	16%
Lodgepole Forest (LP)	892	0	73	140	5	25	243	27%
Willow Riparian (WR)	76	0	0	5	0.10	1	6	8%
Mixed Spruce-fir/Lodgepole Forest (MF)	488	0	24	53	1	4	82	17%
Mountain Brush (MB)	34	0	0	0	0	0	0	0%
Spruce-fir (Old-growth)	697	0	43	41	1	9	94	13%
Spruce-fir (SF)	332	0	25	34	2	9	69	21%
Spruce-fir Savannah (SS)	223	41	17	21	1	3	83	37%
Mixed Savannah (MS)	85	0	14	12	0.48	0.39	27	31%
Special Aquatic Site (SAS)	1	0	0	0	0	0	0	0%
Rock/Scree (SC)	44	0	0	0	0	1	1	3%
TOTALS	4300	129	251	346	28	75	828	19%
MDP: Alternative D								
Grassland/Meadow (GM)	907	79	39	60	13	26	217	24%

Vegetation Type	Acres in PA	Trails			Lifts	Utilities Skiway/Roads Buildings	Acres Affected	Percent Type Affected
		Open ¹	Conven	Gladed				
Aspen (AS)	200	0	13	11	1	7	32	16%
Aspen/Conifer (AC)	219	0	22	24	3	5	53	24%
Lodgepole Savannah (LS)	102	9	3	2	1	2	17	16%
Lodgepole Forest (LP)	892	0	113	200	7	32	353	40%
Willow Riparian (WR)	76	0	5	15	1	3	23	31%
Mixed Spruce-fir/Lodgepole Forest (MF)	488	0	67	91	4	4	166	34%
Mountain Brush (MB)	34	0	0.25	5	0	0	5	15%
Spruce-fir (Old-growth)	697	0	68	86	4	18	177	25%
Spruce-fir (SF)	332	0	38	75	1	11	125	38%
Spruce-fir Savannah (SS)	223	41	32	37	0	5	115	52%
Mixed Savannah (MS)	85	0	17	15	0	0.39	33	39%
Special Aquatic Site (SAS)	1	0	0	0	0	0	0	0%
Rock/Scree (SC)	44	0	0	0	0	1	1	3%
Totals	4300	129	418	620	37	116	1319	31%

¹ Ski trails that occur in naturally open vegetation types

² Conven. = Conventional ski trails which may be cleared or graded up to 90%

³ Gladed ski trails that may have up to 33% of the trees removed

⁴ The Poppyfield utility corridor would require approximately an additional 12 acres, all of which would be in the GM vegetation type.

4.3.2.1.1.2 Plant Species of Special Concern

There are no known populations of federally listed threatened or endangered plant species that occur in the Vail area. However, several populations of federal candidate, Forest Sensitive, and state listed rare species are known to occur within or near the previously developed ski area, although there are no known populations within the PA. These species include brownie lady slipper (*Cypripedium fasciculatum*) and northern twayblade (*Listera borealis*), as detailed in Chapter 3. Impacts to plant species of special concern would therefore be limited to those disturbances occurring in suitable habitat of the PA; they are detailed under the alternative in which they occur. Additionally, impacts to brownie lady slipper, a federally listed C2 candidate species, are analyzed in the BE.

The BE is a document required by the Forest Service that addresses potential impacts to species listed by the Rocky Mountain Region (Region Two), WRNF as Forest Sensitive. The conclusions of the BE are always provided to the public for review whenever a decision is rendered that involved concerns for sensitive or candidate wildlife or plant species. However, a BE may contain information that is sensitive to the security of certain species, and is often not publicly circulated because of this concern.

Similarly, a Biological Assessment (BA) is required by the FWS for species listed as threatened or endangered under the ESA (1973, as amended). It too often contains sensitive information and is usually distributed to agencies with specific responsibilities under the ESA. The BA prepared for this EIS addresses only four species

of Colorado River fish, since no federally listed plant species are known to occur in the PA. The results of the BA are presented to the public in the form of a Biological Opinion (BO). The Aquatic Biology and Vegetation sections of Chapter 3 contain specific information on these documents.

4.3.2.1.2 No Action Alternative

4.3.2.1.2.1 General Vegetation

The No Action Alternative would potentially include impacts to vegetation from a number of smaller, previously authorized projects throughout the Category I and II areas. These impacts could include those related to trail and glade development, as well as lift realignment or replacement. No vegetation within the PA would be directly or indirectly impacted under this alternative.

4.3.2.1.2.2 Plant Species of Special Concern

No known populations of sensitive plant species in the PA would be impacted as a result of implementing the No Action Alternative. However, suitable habitat for both the brownie lady slipper and the northern twayblade exist in the PA that may be impacted by previously approved activities, though these would be subject to environmental review and design considerations prior to construction.

4.3.2.1.3 Center Ridge Alternative

4.3.2.1.3.1 General Vegetation

Impacts to vegetation resulting from implementation of the Center Ridge Alternative would likely include those described above as common to all alternatives, although at a smaller scale than for either of the other action alternatives. Vegetation impacts would principally occur in the eastern half of Super Bowl, the western portion of Pete's Bowl, the ridge area between Super and Pete's bowls, and in Tea Cup Bowl. The construction of ski trails, lifts, skiways, and access roads would potentially impact approximately 445 acres (10 percent of the PA), although over one-third (approximately 160 acres) of the total acreage disturbed occurs in non-forested habitat types (MAP 11). Impacts to non-forested types from trails, lifts, and skiways are minimal due to the presence of naturally open terrain that is suitable for many of these activities with no additional development. There would be no impacts resulting from implementation of this alternative to the vegetation/habitat types MB, SC, or SAS. Impacts to the types MF and WR would be negligible, resulting in disturbance to less than two percent of the type within the PA (Table 4.4).

Impacts to GM, LS, MS, and SS (comprising approximately 11, 18, 31, and 6 percent of each type, respectively, and 36 percent of the total disturbance for this alternative) would be minimal as a result of their naturally open character, with the exception of impacts resulting from roads through these types (approximately 16 acres). With the above exception regarding road construction, most impacts to these types would require little if any grading or other ground disturbance, which also translates to fewer impacts in these areas from eroding topsoil or invasion by weedy species.

Disturbance to the types AS and AC (15 and 9 percent of each type, respectively) would potentially impact a total of 52 acres, although approximately 16 acres of this would be due to glading activities. Given the relatively open, and somewhat fragmented nature of these stands, the proposed glading would probably not result in significant negative impacts to these types. Impacts from conventional trails and lift lines would result in removal of the

aspen or aspen mix overstory on approximately 29 acres, and impacts due to road construction would potentially occur on another 7 acres.

Approximately 170 acres of LP (19 percent of the type within the PA, and 37 percent of the total amount of disturbance) would potentially be impacted under this alternative. Of this total, over half (95 acres) would result from glading activities, while approximately 60 acres would be removed for conventional ski runs and lift lines. An additional 15 acres would be impacted from roads and skiways for this alternative.

The remaining disturbance to vegetation from the Center Ridge Alternative would result from approximately 56 acres of impacts to the type SF (5 percent of the type), of which 42 acres were designated as old-growth (comprising 6 percent of the total old-growth SF in the PA, and 9 percent of the total amount of disturbance). All proposed impacts to old-growth SF under this alternative would occur at upper elevations in the south end of Super Bowl. Glading activities would result in a total of 33 acres of disturbance, of which 27 would potentially be located in old-growth stands. Another 19 acres (13 in old-growth stands) would potentially be impacted as a result of conventional trails and lift lines; skiways and roads would impact an additional 3 acres, two of which have been identified old-growth forest.

4.3.2.1.3.2 *Plant Species of Special Concern*

No known populations of either of the species of concern would be impacted by implementation of this alternative. Areas of suitable habitat for both brownie lady slipper and northern twayblade occur in the extreme upper elevations of Super Bowl, in the old-growth SF habitat on the south end of the bowl. Additional habitat that would be impacted includes the lodgepole pine stands on the ridge that separates Pete's and Super bowls. Portions of these potential habitats would be impacted by proposed development under the Center Ridge Alternative; although neither species has been identified in the PA, there is a known population of brownie lady slipper that occurs in similar habitats within 0.5 miles of the PA boundary.

4.3.2.1.4 Proposed Action

4.3.2.1.4.1 *General Vegetation*

Implementation of the Proposed Action would have impacts to vegetation that are similar in nature to those described for the Center Ridge Alternative, but more extensive in scale. Vegetation impacts would potentially occur in the western portion of Super Bowl, throughout Pete's and East Pete's bowls, on the ridge area between Pete's and Super bowls, and in Tea Cup Bowl. Construction of various proposed ski trails, lifts, skiways, and access roads would potentially impact approximately 828 acres, which comprises 19 percent of the PA (MAP 12). Of the total acreage disturbed, it should be noted that approximately one-third of the impacts (277 acres) occur in naturally open non-forested terrain where disturbance resulting from the development of ski trails, lifts, and skiways would be minimal, as no clearing and very little ground disturbance would be required. There would be no impacts under this alternative to the vegetation types MB and SAS. Further, impacts to the types SC and WR would be negligible due to the small areal extent of these proposed disturbances (3 and 8 percent of each type, respectively), and the fact that impacts would essentially result from these areas being skied over, which requires little, if any, ground disturbance. Winter snow cover of these areas is extensive, and allows for adequate protection of even the taller willows along Two Elk Creek.

Impacts to the naturally open types LS and MS would be essentially identical to those described under the Center Ridge Alternative. Impacts to the type GM would increase somewhat to 144 acres (16 percent of the type), and increase substantially in type SS to 83 acres (38 percent of the total type). As described previously, except for

impacts due to road construction (12 acres), disturbances in these types (comprising 33 percent of the total disturbance for this alternative) would likely be minimal.

Under the Proposed Action, disturbance to the type AS would be identical to that described previously for the Center Ridge Alternative, and increase somewhat in type AC to 33 acres (totaling 67 acres and 15 percent of each type). Approximately 20 acres of the proposed impacts to these types would be due to glading activities. Given the relatively open, and somewhat fragmented nature of these stands, the proposed glading would probably not result in significant negative impacts to these types. Impacts from conventional trails and lift lines would result in removal of the aspen or aspen mix overstory on approximately 38 acres, and impacts due to road construction would potentially occur on another 9 acres.

Approximately 243 acres of LP forest (27 percent of the type within the PA and 29 percent of the total amount of disturbance) would potentially be impacted under this alternative. Of this total, 140 acres of disturbance (over half for this type) would result from proposed glading activities, while approximately 78 acres would be removed for conventional ski runs and lift lines. An additional 25 acres would be impacted from roads and skiways for this alternative.

Impacts to the type MF under the Proposed Action would potentially occur on 82 acres (17 percent of the total acres for the type), the majority of which are located in Pete's Bowl. Impacts associated with glading activities would be responsible for approximately 53 acres of the disturbance (65 percent of the total disturbance for this type); construction of conventional ski trails and lifts would potentially result in another 24 acres of disturbance to MF. Road and skiway construction would remove approximately 4 additional acres of the type MF under this alternative.

Disturbance to vegetation in type SF from this alternative would impact approximately 163 acres (16 percent of the type), of which 94 acres were designated as old-growth (comprising 13 percent of the total old-growth SF in the PA, and 11 percent of the total amount of disturbance). The majority of proposed impacts to old-growth SF under the Proposed Action would occur at upper elevations in the southern portions of East Pete's and Super bowls. Proposed glading activities would result in a total of 74 acres of disturbance, of which 41 would potentially be located in old-growth stands. Another 70 acres (44 in old-growth stands) would potentially be impacted as a result of conventional trails and lift lines; skiways and roads would impact an additional 18 acres, 9 of which have been designated old-growth.

4.3.2.1.4.2 Plant Species of Special Concern

No known populations of either of the species of concern would be impacted by implementation of the Proposed Action. Suitable habitat for both brownie lady slipper and northern twayblade occurs extensively throughout upper East Pete's and Super bowls, with smaller areas of suitable habitat found in some of the drier forested areas of Pete's Bowl. Additional habitat that would be impacted includes the lodgepole pine stands on the ridge that separates Pete's and Super bowls. Portions of these potential habitats would be impacted by proposed development under this alternative. Although neither species has been identified in the PA, there is a known population of brownie lady slipper that occurs in similar habitats within 0.5 miles of the PA boundary.

4.3.2.1.5 MDP Alternative

4.3.2.1.5.1 General Vegetation

There would be significantly greater impacts to vegetation as a result of implementation of this alternative as compared to either of the other action alternatives. Disturbance to vegetation would potentially occur throughout Commando, East Pete's, Pete's, Super, Super West, Lower Sun Down, and Tea Cup bowls. Construction of various ski trails, lifts, skiways, and access roads would potentially impact approximately 1,319 acres, which comprises 31 percent of the PA (MAP 13). Of the total acreage disturbed, it should be noted that approximately one-third of the impacts (407 acres) would potentially occur in naturally open non-forested terrain where disturbance resulting from the development of ski trails, lifts, and skiways would be minimal, as no clearing and very little ground disturbance would be required. Under the MDP Alternative, there would be no impacts to the habitat type SAS and negligible impacts to the type SC due to the small areal extent of these disturbances (totaling less than 3 percent of the type). Additionally, impacts to the type WR, although potentially affecting approximately 23 acres (31 percent of the type), would essentially result from these areas being skied over, and require little if any ground disturbance. Winter snow cover of these areas is extensive, and allows for adequate protection of even the taller willows along Two Elk Creek, resulting in minimal disturbance to this type.

Impacts to the naturally open types GM, LS, MS, and SS would be similar in nature to, although somewhat more extensive than, those presented in the Proposed Action (24, 16, 39, and 52 percent of each type, respectively). As described previously, except for impacts due to road construction (35 acres), disturbances in these types, which comprises 29 percent of the total disturbance for this alternative, would likely be minimal. Approximately 5 acres of the type MB (15 percent of the total type) would be disturbed by gladed trails under the MDP Alternative only. The level of impacts would potentially be fairly minimal, as MB is open enough to be skied as is with no further disturbance, given adequate snow coverage.

Impacts to type AS under this alternative would essentially be identical to those described previously for both the other action alternatives (approximately 32 acres); however, the disturbance to type AC would potentially increase to 53 acres, which comprises 24 percent of the total acreage for the type. Impacts to the two types would potentially disturb a total of 85 acres, of which approximately 35 acres would be due to glading activities. Given the relatively open and somewhat fragmented nature of these stands, glading would probably not result in significant negative impacts to these types. Impacts from conventional trails and lift lines would result in removal of the aspen or aspen mix overstory on approximately 38 acres, and impacts due to road construction would potentially occur on another 12 acres.

Under the MDP Alternative, impacts to LP forest would increase to approximately 353 acres, which comprises 40 percent of the total for the type (and 27 percent of the total amount of disturbance). Glading activities would impact 200 acres of the total disturbed, while an additional 121 acres would be removed for conventional ski runs and lift lines. Roads and skiways for this alternative would impact approximately 32 acres.

Impacts to the type MF under this alternative would potentially occur on 166 acres (34 percent of the total acres for the type). Impacts associated with glading activities would be responsible for approximately 91 acres of the disturbance to this type. Construction of conventional ski trails and lifts would potentially result in another 71 acres of disturbance to MF. Road and skiway construction would remove approximately 4 additional acres of the type MF under this alternative.

Impacts to SF forest and old-growth SF forest would be more extensive under this alternative than for either of the other two action alternatives. These impacts would potentially occur in several large areas of forested

wetlands which tend to be particularly sensitive to disturbance. Approximately 302 acres (29 percent of the type) of SF forest would potentially be impacted, of which 177 acres were designated as old-growth (comprising 25 percent of the total old-growth SF in the PA, and 13 percent of the total amount of disturbance). The majority of impacts to old-growth SF under the MDP Alternative would occur in Commando, East Pete's, and Super bowls, respectively. Glading activities would result in a total of 161 acres of disturbance to SF forest, of which 86 would potentially be located in old-growth stands. Another 112 acres (73 in old-growth stands) would potentially be impacted as a result of conventional trails and lift lines; skiways and roads would impact an additional 29 acres, 18 of which would potentially be constructed through old-growth forest.

4.3.2.1.5.2 Plant Species of Special Concern

No known populations of either of the species of concern would be impacted by implementation of the MDP Alternative. Suitable habitat for both brownie lady slipper and northern twayblade occurs extensively throughout much of the forested habitat that occurs throughout Super Bowl West, East Pete's and Commando bowls, in addition to those areas specified as potential habitat for the two previous action alternatives. Portions of these potential habitats would be impacted by development under this alternative, although neither species has been reported as occurring in the PA. There is a known population of brownie lady slipper that occurs in similar habitats within 0.5 miles of the PA boundary.

4.3.2.1.5.3 Lime Creek Road Corridor

Under the MDP Alternative, a temporary timber haul road would be constructed. It would extend south from near the Commando Saddle (at the extreme upper end of Commando Bowl) for approximately 875 feet before crossing the southern boundary of the PA. The road would continue to the south in the LA for another 5,155 feet before terminating at existing Lime Creek Road. The road would traverse primarily SF forest, much of which has been identified as recruitment old-growth and would result in approximately 3.5 acres of impact to this type. Additionally, the road would cross one large meadow and several smaller meadows designated as types GM or WM. The total impacts to types GM and WM would be approximately 0.5 acres. Impacts to the large meadow and the smaller meadow result from construction of approximately 600 linear feet of road. The proposed road would be removed, recontoured, and revegetated once timber hauling was completed.

4.3.2.2 Potential Mitigation Measures

A discussion of standard mitigation measures and potential mitigation measures that are project-specific for each resource are discussed in Chapter 2. Table 2.11 summarizes the major measures noting their effectiveness and the organizations responsible for authorizing and implementing them.

As detailed in Chapter 2, a number of standard mitigation measures will be employed in order to reduce impacts that may result from implementation of any of the alternatives. In addition, several project-specific mitigation measures were developed to minimize potential impacts to vegetation. The potential effectiveness of these measures, as well as the impacts they would mitigate, is detailed further in Table 2.11.

In order to minimize the loss of native flora, particularly of non-forested vegetation types, and to help reduce the amount of invasion of non-native weedy species, cleared areas can be revegetated using only native seeds and vegetation plugs. The seed mixture should be gathered as close to the site as possible in order to decrease the chance of altering native gene pools through the introduction of stock from other populations, which may be less well-adapted to local conditions. To reduce the loss of forested habitats, construction of conventional runs could be minimized in favor of gladed runs; the glades should concomitantly keep tree removal to the lowest level

feasible, or utilize limbing of trees rather than removal. Limbing trees would be particularly beneficial in some old-growth and other heavily forested areas that may harbor unusual, rare, or sensitive flora and fauna, as the canopy cover would not be reduced. This would effectively result in retaining the low-light and increased moisture conditions which some understory species require. Finally, the impacts associated with vegetation type conversion within avalanche paths (resulting from the prolonged application of avalanche control measures) could be mitigated by periodic cutting of trees within the chutes in order to replicate the function of large snow slides.

4.3.2.3 Unavoidable Adverse Impacts

If any of the action alternatives were implemented, there would be an unavoidable loss of the functional values that the missing vegetation currently provides to wildlife, biodiversity, watershed stability, and the botanical community in general during that period when the vegetation would be missing. The conversion of one vegetation type to another would have the unavoidable impact of changing the overall mosaic of vegetation types. These changes would unavoidably alter the flora and fauna, especially the native species, dependent on the current mix of vegetation types.

4.3.2.4 Cumulative Effects

The direct and indirect impacts to vegetation resulting from implementation of any of the action alternatives would add to the cumulative acreage of native vegetation types (both forested and non-forested) in the LA and RA that have been disturbed, or that may be in the foreseeable future. These disturbances range from removal of the forest overstory due to logging activities throughout the area, to conversion of the native flora in both forested and non-forested areas to seeded non-native plant species such as those found in ski trails, lawns (including golf courses), and various agricultural crops. A variety of other disturbances have led to the destruction of native vegetation types through such activities as mining; construction of various homes, hotels, businesses, ski facilities, and associated buildings; construction of roads, parking lots, and other transportation structures; and, construction of reservoirs. Other disturbances to native vegetation such as those resulting from grazing, recreational use (including hiking and biking trails and campgrounds), and their associated activities also impact native vegetation, although at a reduced intensity compared to those discussed above. These impacts often include trampling, selective removal of some desired native species, and particularly, the corresponding introduction of undesired non-native and often weedy plants species.

These impacts have all contributed cumulatively to additional losses and fragmentation of native vegetation/habitat types, which commonly result in further impacts to wildlife populations and biodiversity. These losses may become more significant when habitats of already rare plant and animal species are affected; these impacts are covered in more detail in the Wildlife and Biodiversity sections of this chapter.

On-going and past logging operations would interact cumulatively with the proposed development, due to the large volume of timber potentially removed under any of the action alternatives. Much of the timber removed from the forest has been utilized in commercial timber harvest, however, additional timber in the late 1800's and early 1900's was utilized to provide support beams for local mining operations and to provide both railroad ties and fuel for steam powered locomotives. As a result, logging has occurred over much of the LA and RA, though no evidence of historic timber harvest is evident in the PA. Given the association with mining and railroads, much of the historic logging took place south and east of the PA. To a more limited extent, logging activity has taken place east of the PA, much of the forested land within the LA and RA (especially that to the south and west of the PA) was historically logged. This may account for the overall greater percentage of old-growth spruce-fir stands identified within the PA, as compared to the landscape area (67 and 23 percent, respectively). Additional impacts to vegetation resulting from construction of the necessary timber access and hauling roads should also

be considered (see the Biodiversity section of this chapter for further details concerning the amount and impacts of existing roads within the various analysis areas). In particular, the impacts from the final cut of the Lime Creek area, and the potential for a sale in Timber Creek should be taken into consideration when predicting the cumulative impacts to vegetation through logging activities. Plans for timber harvest on private land are not generally documented or available, but are not expected to be significant. Further details regarding the cumulative impacts of timber activities can be found in the Timber Resources section of this chapter.

Mining and other resource exploration and extraction efforts have occurred widely throughout much of western Colorado, and the Vail area is no exception. In addition to the impacts to forests due to the need for mine shaft supports and ore cart tracks, mining era activities have left the legacy of numerous old roads, access trails, and tailings piles, all of which affect vegetative resources to greater or lesser degrees. In the past, mining activities were concentrated in the areas west and south of the PA (such as the areas around Gilman, Red Cliff, and Leadville), but were limited or non-existent throughout much of the proposed development area. Many of these activities are on-going in Leadville and surrounding areas, and will continue for the foreseeable future.

Grazing has been historically, and remains today, a viable activity throughout portions of the forest. The widespread impacts on both upland and wetland vegetation types as a result of livestock grazing are well documented and much in debate. These impacts may include: 1) change in species composition, 2) denuding of over-grazed areas, 3) introduction of non-native species, 4) detrimental impacts to riparian zones, 5) trampling, and, 6) a variety of other micro- and macro-scale effects. Large portions of the naturally open areas (such as those found within Pete's and Super bowls in the PA), mountain brush zones, and aspen stands within the landscape area have been or are part of traditional grazing allotments. Grazing may have greater impacts at the regional level of analysis, due to the widespread use of sagebrush steppe and grasslands found in the river bottom valleys as livestock foraging areas. Other agricultural activities, such as the lettuce farming of the past (particularly in the Eagle River Valley) and current levels of grass, hay, and alfalfa production, have also contributed significantly to native vegetation type conversion.

Perhaps one of the most pervasive yet least noticed, understood, nor quantified detrimental impact to native vegetation results from the introduction of non-native elements to the flora. Native species can be out-competed and may be eventually replaced by aggressive, weedy introduced plant species (as detailed in the Biodiversity section of this chapter). Many non-native plant species have been introduced purposefully in order to decrease erosion potential, increase forage material, or as ornamentals; others have accidentally spread from contaminated feed, agricultural seed sources, animal droppings, and railroad or highway construction activities. As long as non-native species are utilized in revegetation or reclamation seed mixes, the cumulative impacts of introducing these species will continue.

Conversion and/or destruction of native vegetation types in both forested and non-forested types has and will continue to occur as a result of development of both public and private land in the greater Vail area (Vail to Gypsum). These developments and improvements plus those associated with planned activities at Vail, Beaver Creek, and Arrowhead ski areas could interact significantly to increase cumulative impacts to native vegetation. If development of the proposed Adam's Rib Recreation Area were to occur these same types of impacts would also result.

4.3.3 WETLANDS

4.3.3.1 Direct and Indirect Impacts

4.3.3.1.1 Impacts Common to All Action Alternatives

A number of direct and indirect impacts to wetlands and special aquatic sites (SASs) located within the PA could result from the Proposed Action or alternatives to it, and are described below. Specific impacts to wetlands are described below by alternative. These impacts could occur as a result of dredge or fill activities in a wetland, alteration of the hydrology and subsequent loss of saturated soil conditions, disturbance in adjacent upland areas and the resultant increases in wetland sediment deposition, or a combination of the previous factors. Depending on their magnitude, less severe impacts may not completely destroy the entire wetland but can adversely affect portions of the wetland or wetland functional values. Impacts that could cause wetland losses through the destruction or decrease in functional values of wetlands and SASs in the PA include placing culverts, constructing and operating roads, grading wetlands and source areas of hydrology, altering stream courses, placing fill in or dredging material from wetlands, disturbing wetland surfaces, constructing bridges across wetlands, and cutting vegetation in wetlands. The functions of riverine habitats (e.g., streams and channels throughout the PA) and their surrounding wetlands could be lost by culverting streams and/or altering stream channels.

The impacts discussed above may be permanent, long term, or short term, depending on the degree and extent of the disturbance. Existing wetlands impacted by altering the hydrology, soils, or vegetation could take years to fully redevelop to their pre-disturbance functional level, as could constructed wetlands associated with potential compensatory mitigation projects intended to replace lost functional values. Building bridges over wetlands is an option that can be used to avoid direct impacts. However, in the long term, wide bridge structures could reduce some functional aspects of wetlands and SASs by shading out vegetation.

Another type of disturbance to wetlands, flush cutting of surface vegetation including woody species (trees and willows), is not an ACOE-regulated activity if the root system is not physically disturbed in the cutting process (33 CFR 323.2(d)(2) and 40 CFR part 232.2(e)(2)). However, vegetation cutting may result in losses or decreases to some of the wetland functional values. Vegetation comprises one of the three identification parameters of a wetland (along with soils and hydrology). Altering the existing vegetation invariably changes the character of the wetland, particularly in forested or riparian wetland types. These changes occur because both macro- and micro-habitats within the wetland may be affected by removal of the canopy cover. Particularly, the clearing or glading of trees on forested seep wetlands could result in the loss of unique microhabitats where orchids and other uncommon understory hydric species are found. Cutting willows in riparian shrub wetlands could also affect the macrohabitat of riparian wildlife species, displacing song birds and small mammals that prefer dense cover. Changes in the water balance may also occur as a result of these activities, due to potential changes in rates of transpiration and evaporation. Flush cutting woody vegetation may also diminish the ability of a plant's root system to perform bank stabilization functions, resulting in increased bank and soil erosion.

Construction projects involving dredge and fill or other regulated activities in wetlands require that the proponent obtain a Section 404 permit from the ACOE under the Clean Water Act. For this proposed project the ACOE will require an application for an individual permit and submittal of a 404(b)(1) Guidelines Alternative Analysis which will address losses of wetland values and functions. It should be noted that only impacts resulting from dredge and fill activities are subject to Section 404 regulation. Other impacts to wetlands, such as surface cutting of vegetation and skiing over wetlands may constitute an ecological impact of varying intensity, but are not regulated by the ACOE. Therefore, the summary of wetland impacts presented in Tables 4.5 through 4.7 was

segregated by both alternative and type of impact. A more complete version of these tables is attached in Appendix C; note that they contain a wetland identification number which denotes both the wetland complex and type involved in each potential impact (Tables C.2-4, Appendix C).

Of the action alternatives, Center Ridge has the least wetland impacts (0.34 acres jurisdictional impacts, 0.57 acres ski-over only), followed by the Proposed Action (3.07 acres jurisdictional impacts, 3.68 acres ski-over only) and the MDP Alternative (20.67 acres jurisdictional impacts, 7.52 acres ski-over only), respectively. It should be noted that the vast majority of regulated impacts to wetlands under the Proposed Action occur in East Pete's Bowl, and under the MDP Alternative occur in both Commando and East Pete's bowls.

4.3.3.1.2 No Action Alternative

There would be no impact to wetlands in the PA as a result of implementation of the No Action Alternative. However, this alternative could include implementation of a number of previously approved projects on NFS lands, and, potentially, development on private land outside the PA. Both of these activities may have associated impacts to an unknown number of wetlands. Although neither of these activities would require Forest Service approval, any jurisdictional wetland impacts resulting would potentially require permitting of some type by the ACOE.

4.3.3.1.3 Center Ridge Alternative

Implementation of this alternative could result in 0.34 acres of regulated impacts to wetlands within the PA, due to construction of the proposed bridges, access roads, and trails (Table 4.5). Table C.2 (Appendix C), identifies the specific impacts to individual wetlands, including their wetland type and the acreage involved. Most of the regulated dredge and/or fill activities proposed under this alternative would take place in the Two Elk Creek complex (MAP 14), as a result of the skiway (Intertie) access along the south side of Two Elk Creek.

Table 4.5. Wetland Impact Table for the Center Ridge Alternative (acres)		
Two Elk Creek Wetland Impacts		
Type of Feature	Dredge & Fill Disturbance	Ski Over/Veg Trim Disturbance
Bridges	.055	0
Skiways	.211	0
Skiway-roads	.050	0
Ski Trails	0	0.042
Disturbance Subtotal for Two Elk Creek wetlands	0.32	0.04
Super Bowl Wetland Impacts		
Ski Trails	0	0.187
Disturbance Subtotal for Super Bowl wetlands	0	0.19
Tea Cup Bowl Wetland Impacts		
Ski Trails	0	0.339
Skiway-roads	.022	0
Disturbance Subtotal for Tea Cup Bowl wetlands	0.02	0.34
Total Wetland Disturbance for Center Ridge Alternative	0.34	0.57

An additional 0.57 acres could be impacted by being skied over or by having woody vegetation trimmed (both non-regulated activities). Given adequate snow depth, the impacts resulting from skiing over wetlands and SAS's would be negligible. Indirect impacts to wetlands could potentially occur as a result of sediment deposition from disturbance in adjacent uplands. Although the exact extent of these indirect impacts is non-quantifiable, they are largely controllable with proper planning, construction techniques, and mitigation measures.

4.3.3.1.4 Proposed Action

Construction of all of the various elements of the Proposed Action would potentially result in regulated impacts to 3.07 acres of wetlands (Table 4.6). Table C.3 (Appendix C) identifies the specific impacts to individual wetlands, including the wetland type and acreage involved. The majority (88 percent) of impacts to wetlands from this alternative would occur as a result of proposed ski trail construction in a large forested wetland complex in upper East Pete's Bowl (MAP 15). A utility line from the top of Vail Mountain to the proposed restaurant would cross two small drainages that would qualify as waters of the U.S. The acreage of impact from the utility line would be approximately 0.01 acres. Construction of the utility line would not involve dredge and fill in a wetland and would likely qualify under a Nationwide 404 permit as a utility crossing.

Table 4.6. Wetland Impact Table for the Proposed Action (acres)		
East Pete's Wetland Impacts		
Type of Feature	Dredge & Fill Disturbance	Ski Over/Veg Trim Disturbance
Skiways	0	0.066
Ski Trails	2.691	0.217
Disturbance Subtotals for East Pete's wetlands	2.69	0.28
Two Elk Creek Wetland Impacts		
Ski Trails	0.000	2.012
Bridges	0.069	0
Skiways	0.211	0
Skiway-roads	.050	0
Disturbance Subtotal for Two Elk Creek wetlands	0.33	2.01
Pete's Bowl Wetland Impacts		
Skiway-roads	.024	0
Skiway	0	0.151
Ski Trails	0	0.712
Disturbance Subtotal for Pete's Bowl wetlands	0.02	0.86
Super Bowl Wetland Impacts		
Ski Trails	0	0.187
Disturbance Subtotal for Super Bowl wetlands	0	0.19
Tea Cup Bowl Wetland Impacts		
Ski Trails	0	0.339
Skiway-road	.022	0
Disturbance Subtotals for Tea Cup Bowl wetlands	0.02	0.34
Total Wetland Disturbance for the Proposed Action	3.07	3.68

An additional 3.68 acres would potentially be impacted by non-regulated activities occurring throughout the PA, but concentrated along Two Elk Creek (Table 4.6 and Appendix C, Table C.3). Due to the larger area affected, indirect impacts to wetlands within the PA would be similar in nature to, although more extensive in scale, than those described under the Center Ridge Alternative. These impacts should also be controllable in large part by implementation of appropriate planning, construction techniques, and mitigation measures.

4.3.3.1.5 MDP Alternative

Implementation of the MDP Alternative would potentially impact approximately 20.67 acres of wetlands through dredge and fill activities (Table 4.7). These disturbances would result from the construction of ski trails, access roads, skiways, and bridges. Specifically, impacts would be concentrated in the forested wetland complexes occurring in both Commando and East Pete's bowls, and along Two Elk Creek (MAP 16). These areas would account for approximately 98 percent of the regulated impacts under this alternative. Table C.4 (Appendix C), identifies the specific impacts to individual wetlands, including wetland type and the acreage involved. The same utility line discussed under the Proposed Action would be necessary under Alternative D with the same 0.01 acres of impact.

Table 4.7. Wetland Impact Table for the MDP Alternative (acres)		
Commando Bowl Wetland Impacts		
Type of Feature	Dredge & Fill Disturbance	Ski Over/Veg Trim Disturbance
Ski Trails	11.17	0.189
Disturbance Subtotals for Commando wetlands	11.17	0.19
East Pete's Wetland Impacts		
Skiways	0	0.066
Skiway-roads	0.70	0
Ski Trails	5.551	0.999
Disturbance Subtotals for East Pete's wetlands	6.25	1.07
Two Elk Creek Wetland Impacts		
Ski Trails	2.34	3.771
Bridges	0.069	0
Skiways	.021 1	0
Skiway-road	0.050	0
Disturbance Subtotal for Two Elk Creek wetlands	2.67	3.77
Pete's Bowl Wetland Impacts		
Skiway-roads	.024	0
Skiway	0	0.151
Ski Trails	0	0.712
Disturbance Subtotal for Pete's Bowl wetlands	0.02	0.86
Super Bowl Wetland Impacts		
Ski Trails	0	1.219

Type of Feature	Dredge & Fill Disturbance	Ski Over/Veg Trim Disturbance
Skiway-Roads	.093	0
Disturbance Subtotal for Super Bowl wetlands	0.09	1.21
Super Bowl West Wetland Impacts		
Skiway-Roads	.008	0
Disturbance Subtotal for Super Bowl West	0.01	0
Lower Sun Down Bowl Wetland Impacts		
Skiway	0	.080
Skiway-Road	.38	0
Bridge	.049	0
Disturbance Subtotal for Lower Sun Down Bowl	0.429	0.08
Tea Cup Bowl Wetland Impacts		
Ski Trails	0	.339
Skiway-roads	.022	0
Disturbance Subtotal for Tea Cup Bowl wetlands	0.02	0.34
Total Wetland Disturbance for MDP Alternative	20.67	7.52

Non-regulated impacts would potentially occur on another 7.52 acres of wetlands within the PA. As with the other two action alternatives, these impacts are concentrated along Two Elk Creek (3.77 acres), where approximately half of the ski-over impacts occur. Indirect impacts would be of the same type as those described previously for the other two action alternatives, but would potentially occur over a much larger area, due to the increase in affected area under this alternative. As discussed for both the other action alternatives, proper planning and implementation of appropriate construction techniques and application of the necessary mitigation measures can control many of these indirect impacts.

4.3.3.1.6 Optional Lime Creek Road Corridor

There would be no impacts to wetlands in the PA resulting from construction of the optional Lime Creek Road. However, there would be impacts to wetlands in the LA. The road would traverse a large patch of recruitment SF forest. In many places, this forest contains extensive patches of forested seep wetland complexes. However, the current road alignment keeps above and to the east of the seep complexes and traverses only dry forested areas. The road would cross a wet meadow wetland and associated channels. Impacts there would consist of approximately 50 linear feet of road (<0.03 acres), with a culvert in the actual channel. A smaller wet meadow could potentially have impacts of less than 0.1 acre along its eastern edge where it would be crossed by the road. These impacts would be limited to two crossing of 10-20 feet each. The total wetland impacts resulting from placement of this road would be less than 0.5 acres. Note that this wetland impact was not included in Table 4.7 because the impact it would have to wetlands is outside the PA.

4.3.3.2 Potential Mitigation Measures

A discussion of standard mitigation measures and potential mitigation measures that are project-specific for each resource are discussed in Chapter 2. Table 2.11 summarizes the major measures noting their effectiveness and the organizations responsible for authorizing and implementing them.

In addition to the standard mitigation measures detailed in Chapter 2, several specific mitigation measures were developed to minimize the severity and/or extent of dredge and fill in wetlands and the loss of functional values in riparian areas due to vegetation trimming and ski-over. Dredge and fill impacts could be reduced by having a qualified wetland specialist on site when wetland crossings occur. The specialist would be available to provide advice on crossing techniques and would ensure that equipment operators cross in the most efficient manner possible. Additionally, detrimental effects to the willow riparian communities that would be skied-over could be reduced by identifying those areas most suitable for crossings (preferably areas with shorter-statured willows) and limiting skiers to those areas so that longer stretches of the riparian corridor are not affected. Impacts to the willow riparian communities could further be lessened by not trimming the willows any closer than 18 inches above the ground surface. This would help to maintain shrubs that would be viable during the growing season and provide for healthy root systems in affected riparian communities.

4.3.3.3 Unavoidable Adverse Impacts

If any of the action alternatives were implemented, there would be an unavoidable loss of the functional values that the missing wetlands currently provide to wildlife, biodiversity, watershed and stream stability, and the botanical community in general. It would persist in general during that period when they would be missing or in an altered state. The conversion of wetlands to uplands or developed facilities would have the unavoidable impact of changing the overall mosaic of habitat types within the specifically disturbed area. These changes would unavoidably alter the microhabitat within some of the forested wetland types that support uncommon flora and fauna that are dependent on those wetlands. If seep wetlands were affected, it would be very difficult if not impossible to replicate their form and function within the PA.

4.3.3.4 Cumulative Effects

Wetland losses resulting from implementation of any of the action alternatives would add cumulatively to losses that have occurred in the Vail area in the past and those that may occur in the foreseeable future. Historically, wetlands in montane forest settings similar to those in the PA have been impacted by human activities such as mining, logging, grazing, ski area development, construction of private homes and commercial building, construction of roads and parking areas, construction of reservoirs, and development of springs. These activities have impacted wetlands both directly and indirectly.

Logging and mining were important sources of wetlands impacts in the past. Roads associated with logging and mining access directly impacted aquatic resources through placement of dredge and fill in wetlands and riparian areas. In addition, disturbance of protective upland vegetation resulted in increased sedimentation deliveries, often degrading the system. In the case of mining, placement of tailings and mine spoils in wetlands not only resulted in fill, but also introduced toxic chemicals into the water, further decreasing the capacity of the wetland to support the functions and values it previously maintained. Although mining and logging contributed most significantly to cumulative wetland losses before the advent of current regulations and guidelines when these activities were a more important aspect of the local economy, they still occur, although at a smaller scale.

Most impacts to wetlands from grazing have occurred in riparian zones and riparian-associated wetlands. Cumulative impacts to both wetlands and the fauna they support (such as boreal toads, a candidate species for federal listing) are detailed in this section and in the Wildlife section of this chapter. Within the PA itself, grazing and recreation are the major ongoing cumulative impacts to wetlands.

Construction of the existing towns, roads, and other infrastructure has also contributed to both historic and ongoing wetland losses. Included in this category are private residences constructed by individuals as well as

development and construction directed by local, county, and state governments. In particular, actions in the foreseeable future that may impact wetlands include ongoing development within Eagle County, including development at existing and new ski areas; development at new or existing subdivisions; and development of any new water impoundment facilities.

Ongoing and future residential and commercial development within the Eagle Valley may add cumulatively to wetland losses. Prime construction land often occurs in the more gently sloping valley-bottoms, where water derived from the surrounding mountain terrain tends to accumulate and create wetlands. Preparing these sites for the construction of buildings, access roads, and utility corridors often necessitates dredge and fill of local wetlands. Developments are possible on several parcels of land within the LA. Among these are land in the TOV, Town of Minturn, and in unincorporated areas in the Game Creek and Red Cliff-Gilman areas. If developed, each of these could present cumulative wetland impacts.

Ski area developments represent a specific type of development within the analysis area, which are of particular concern because they have an increased potential to impact the same type of high elevation montane wetlands as those found in the PA. Past and ongoing work at Vail, Beaver Creek, and Arrowhead ski areas have resulted in impacts to wetland resources. Included in this category are the wetland losses associated with the original construction of the resorts and related support facilities, as well as subsequent development and summer operation programs. In the realm of the foreseeable future is the completion of the Bachelor Gulch expansion at Beaver Creek Ski Area. The construction of the proposed Adams Rib Recreation Area near Eagle, Colorado, would also contribute to a significant amount of wetland loss if it were constructed. In addition to potential wetland impacts that may occur during construction of the ski area itself, other significant wetland losses may result from associated real estate development.

Given the rapid growth in the Vail Valley, and in Colorado in general, future water development projects are possible. Among these is a potential reservoir at Iron Mountain near Red Cliff, and water diversions in the Homestake area in the Holy Cross Wilderness. Although there are currently no proposals, if constructed they would impact existing wetland and riparian resources and potentially greatly add to the cumulative wetland losses that have already occurred in the area.

4.3.4 WILDLIFE

4.3.4.1 Direct and Indirect Impacts

4.3.4.1.1 Impacts Common to All Alternatives

4.3.4.1.1.1 General Wildlife

In general, the construction and operation of ski trails, lifts, roads, or associated development would impact wildlife directly and indirectly. The presence of workers and equipment during the construction phase of the project would result in direct impacts to wildlife via the displacement of animals from their home ranges. In the case of relatively mobile species (e.g., coyote, bobcat, birds), these impacts would likely be negligible provided animals could move to unoccupied habitats in the PA and LA. However, less mobile animals, primarily small mammals (e.g., southern red-backed voles, northern pocket gophers, western jumping mouse), would probably experience increased mortality rates as a result of construction activities.

Phased construction lengthens the period of on-site disturbance but, conversely, may also be considered a mitigation measure due to the fact that it would minimize concurrent effects over the PA. Continued maintenance of lifts and ski trails would periodically disturb wildlife inhabiting open meadows, seeded ski trail habitat, and forested habitat adjacent to lifts, roads, and ski trails.

Other direct impacts would include the conversion of portions of forest stands to seeded ski trail habitat through lift and trail construction, and localized reductions in forest canopy cover through glading. The creation of conventional ski trails and chairlifts converts forested habitats to a maintained grassland/meadow type through the removal of all trees and revegetation of the area grasses and forbs. Glading removes up to 30 percent of the trees, thereby creating a forest savannah habitat. These impacts would reduce the availability of potential breeding, foraging, and wintering habitat for forest-interior and snag-dependent wildlife (e.g., marten, boreal owl, three-toed woodpecker, golden-crowned kinglet, mountain bluebird). In addition, forest conversion may impact forest-interior and edge-sensitive species through the fragmentation of suitable habitat. Conversely, construction of maintained grassland/meadow openings through forest blocks would create habitat for edge-tolerant species (e.g., broad-tailed humming bird, deer, snowshoe hare, meadow vole). The result of these habitat conversions may directly affect wildlife by increasing populations of edge-tolerant species and decreasing populations of forest-interior species.

Habitat fragmentation is defined by Noss and Cooperrider (1994) as, "The process by which habitats are increasingly subdivided into smaller units, resulting in their increased insularity as well as losses of total habitat area." Fragmentation can be interpreted relative to the tolerance that a given species has for spacing between blocks of suitable habitat within their home range. Some species require large unbroken tracts of habitat and are adversely affected by any fragmentation of that habitat, while other species can do well with some fragmentation. The gradient of preferences is bounded by forest-interior species on one side and edge species on the other. Discussions involving fragmentation are also found in the Vegetation and Biodiversity sections of this EIS. When the comment is made in this EIS that a given action would fragment habitat within the PA, it is based on the premise that the edge-intolerant species would be adversely affected.

Dense stands of lodgepole pine occur in the PA along many of the north-facing slopes at mid to lower elevations (MAP 5). Currently, understory vegetation in these stands is comprised of only grouse whortleberry and elk sedge. Consequently, the value of these areas for wildlife is limited. Pre-development inventories documented relatively little use of these stands by breeding birds, presumably because of the dense canopy cover and subsequent lack of suitable understory cover (Thompson 1994a). Also, the only small mammal trapped in these dense lodgepole pine stands was the southern red-backed vole (Pioneer 1995b). Construction of ski trails through these stands would open the upper canopy and increase production of mid and understory vegetation along the edges. If this were to occur, foraging habitat for herbivorous animals and, thus, the predators that depend on them may increase. However, this effect would be limited to relatively narrow bands along the ski trail edges.

Snowshoe hare should also benefit from ski trail construction in dense stands of lodgepole pine and mixed conifers. Snowshoe hare utilize coniferous forests, including lodgepole pine forests, where there are at least 1,000 stems per acre. However, maintenance of large population levels requires greater than 2,000 stems/acre (Koehler and Aubry 1994). Currently, there are relatively few stands within the PA that meet this criteria (MAP 9). Opening dense stands would likely improve snowshoe hare habitat, and indirectly improve foraging habitat for lynx, which feed primarily on hares. Conversely, opening dense forest stands and compaction of snow by skiers and grooming machines would allow predators such as coyote and bobcat to utilize these areas for hunting in winter, which may increase competition with lynx for hare and secondary prey species.

Minor portions of grassland/meadow and forest savannah habitats would be directly impacted through grading and contouring, seeding, and skiing. These impacts would not fundamentally change the habitat type or structure of this acreage. Individual tree removal would result in the loss of some cover, nesting, and foraging sites for birds and small mammals. However, the increase in maintained grassland/meadow habitat would provide increased foraging opportunities for certain herbivores (e.g., northern pocket gopher, montane vole) and could subsequently increase prey availability for predators such as coyote, bobcat, and raptors.

Winter recreation in the LA could increase under all the alternatives, particularly alpine and nordic skiing. These activities have the potential to disturb wildlife that are active in winter and species that den in the area. Skiing, grooming machines, and snowmobiling result in compaction of snow, and may reduce the suitability of areas to subnivean mammals or, conversely, improve conditions for the predators that hunt them.

Summer recreational activities, such as camping, mountain biking, hiking, and horseback riding, as well as summer maintenance activities are generally concentrated along existing roads, trails, ski runs, and facilities. Currently, the roads and trails used for recreation in the PA include the Two Elk and Commando Run Trails, Sleepytime Road, and a four-wheel drive road at the top of Super Bowl (MAP 1 and Figure 1.2). Recreational activities would continue to impact wildlife using habitats directly adjacent to existing roads and trails. Impacts typically involve disturbing wildlife and causing them to hide or move quickly toward escape cover. In any particular instance, the zone of direct influence depends on the density of vegetation and its adequacy as hiding cover in the habitat type the recreationist is using. Indirect impacts could also include disturbance to animals using adequate hiding cover. For example, unleashed dogs traveling with recreationists may pursue and consume small mammals and birds, as well as pursue larger wildlife. These impacts would continue and likely increase as more people become aware of the recreational opportunities in and around the PA.

All of the action alternatives would involve various levels of timber harvest (see Timber Resources). Three options are considered that would address the removal of harvested timber from the PA. One option would require all timber cut to be burned on site. No additional roads would be required with this option under any alternative, and no additional habitat alterations would be made. The other two options would require a portion of the timber removed to be hauled by trucks from the PA. Thus, timber would need to be hauled up Sleepytime Road and down the front side of Vail Mountain, or up the CAT III area and out to the existing Lime Creek road system via a temporary road (see Timber Resources section for road location). Of these two potential routes, the Lime Creek option would impact wildlife more than the Sleepytime Road. Even though it would be open only 3 to 5 years, its construction would directly impact wildlife in the LA. Disturbance of wildlife in areas along the road would occur during its use, and through the temporary conversion of vegetated habitat to a graded road, cleared of vegetation. This conversion would result in a temporary loss of habitat for wildlife along the optional road's entire 1.3 mile length. Of particular concern would be the spruce-fir recruitment/old-growth stand just outside the PA. Construction of a road through this stand would reduce habitat for forest-interior and snag-dependent species (e.g., lynx, marten, red-backed voles, boreal owl, three-toed woodpecker, golden-crowned kinglet) and increase habitat for edge-tolerant species.

Indirect impacts to wildlife on the PA would also be incurred from the optional Lime Creek Road. These impacts would mainly occur through the creation of an additional and easily accessible access route into the PA. Winter and summer recreationists (e.g., nordic skiers, mountain bikers) would have additional trail/road access from Vail and Minturn to Red Cliff and Vail Pass during the 3 to 5 years this road would be in use. This potential connection of destination points would attract recreationists to the PA, thereby increasing the probability of human/wildlife interactions in the PA and LA.

4.3.4.1.1.2 *Species of High Public Interest*

Elk, mountain lion, and black bear tend to avoid concentrations of human activity. Thus, these species would avoid or move away from areas under construction, being actively logged, or occupied by large numbers of people. These species are capable of moving considerable distances, and should not incur direct mortality from construction related activities. However, animals may be subject to increased rates of mortality if they are displaced into marginal or unsuitable habitats. After construction is complete, these species should slowly begin to re-occupy available habitat within the PA. Elk apparently avoided China Bowl in the CAT II area during its development (Morrison and Alldredge 1992). However, elk observations in China Bowl increased from 4 percent of pre-development levels immediately following development, to 44 percent of predevelopment levels 3 years after construction was completed (Alldredge 1993; Morrison et. al. 1995). Although this level of post-development use by elk may appear low, it was considered substantial given that there was 11.2 percent total ground disturbance and 4.1 percent timber removal from an area that was only 20 percent forested (Morrison and Alldredge 1992). The increase in post-development use of China Bowl was probably due to the lack of human activity in the area during critical periods which, according to Morrison et. al. (1995), is likely to be more disruptive than short-term physical disturbances from construction.

Expanded recreational activities would result in increased opportunity for human-wildlife interaction as well as potential conflict during the summer and fall. A sharp increase in the frequency of human disturbance could cause interruption or relocation of elk, mule deer, and black bear breeding activities. Increased activities (i.e., mountain biking, hiking, horseback riding) might disturb elk during critical time periods (e.g., calving) and may cause a decline in the local population through increased calf mortality. If elk were displaced from the Two Elk Creek drainage during the calving season they would have opportunity to find other suitable calving habitat but those opportunities are limited. Given that the closure of China Bowl during May 1 through July 1 to traffic and activity would remain in place under implementation of all alternatives, this Draft EIS concludes that if Alternative B or C were implemented, sufficient elk calving habitat would remain available and usable to support the elk herd currently using the PA. The same is true if Alternative D were implemented but some additional mitigation may be necessary.

4.3.4.1.1.3 *Threatened, Endangered, or Forest Sensitive Wildlife*

No adverse impacts to any threatened or endangered species are anticipated due to existing or expanded summer recreational activities resulting from development of the PA. However, adverse impacts to individuals listed as candidate and Forest Sensitive species would be expected. Construction of ski trails and associated facilities in mature and old-growth forest stands may decrease available breeding habitat for snag- and log-dependent species (e.g., three-toed woodpecker, marten) and other forest-interior species associated with these stands (e.g., lynx, golden-crowned kinglet). Additionally, construction may result in the mortality of some individuals. As noted earlier, a BE was prepared for this proposed project. In general, the BE concludes that individuals for some of the fish, plants, and wildlife species listed by the WRNF as Forest Sensitive may be adversely affected but that implementation of any of the action alternatives would not cause a trend toward federal listing nor a loss in species viability rangewide.

4.3.4.1.2 Alternative A - No Action Alternative

This alternative would have the fewest short-term adverse effects to wildlife of any of the alternatives. Under the No Action Alternative, there would be no direct, indirect, or cumulative impacts to any of the wildlife habitats associated with construction of lifts, trails, glades, restaurants, or roads. However, ongoing impacts attributable

to general recreation, off-site developments, and ski facilities in the area would continue. Impacts described below would also occur under Alternatives B, C, and D.

Existing summer recreational activities such as camping, mountain biking, hunting, and hiking are concentrated along Two Elk Creek and along the ridges above Super Bowl and Commando Bowl. On the front side of the ski area summer recreation includes a relatively intense program of activities, such as mountain biking, hiking, and picnicking. The use of these areas for recreational activities would most likely increase and continue to directly affect wildlife through disturbance and harassment. Summer recreational activities in wildlife habitat can interrupt or cause abandonment of wildlife breeding activities for species sensitive to human interaction, such as northern goshawk and wolverine in situations similar to the front side of Vail Ski Area and other areas of concentrated recreation (Howard and Postovit 1987; Banci 1994).

Another existing summer and fall activity associated with the CAT III area is livestock grazing. Under the No Action Alternative, grazing within the PA would continue. Livestock utilize water in and around Two Elk Creek and its tributaries. Of particular concern in this regard is Commando Pond, where boreal toads have been observed. Continued use of this pond by sheep would promote the siltation of the pond as well as the loss of aquatic vegetation and the degradation of the surrounding terrestrial system due to trampling.

Existing winter use of the PA consists of limited snowcat skiing that may continue under this alternative. Winter recreation in the LA would also continue and likely increase. Alpine skiing is generally confined to the existing ski area. Nordic skiing occurs on the Commando Run Trail above Two Elk Pass and Commando Bowl. Nordic skiing and snowmobiling also occur throughout the Lime Creek and Turkey Creek drainage, and the Shrine Pass area. These activities would continue to directly and indirectly affect wildlife that use the LA in winter.

Certain disciplines have been described and analyzed in terms of "pods". A pod is a lift and its associated trails. In most cases, a pod represents a definable geographical unit (such as a sub-watershed) in which description and analyses can be discussed in detail due to the reduction and refinement of the analysis area. In some cases, the pod shares a name with a larger unit used in this document. For example, Super Bowl is discussed in terms of the Super Bowl West, Super Bowl Long and the West Super Bowl pods. MAPs in the last section of the document depict these pods for some resource discussions. This method was used in the analysis of vegetation, wetlands, wildlife, and biodiversity. The description of wildlife and biodiversity have used the pod convention.

4.3.4.1.3 Alternative B - Center Ridge Alternative

Impacts under implementation of this alternative would be restricted to those areas associated with Super Bowl, Ridge Lift, and Tea Cup pods (MAP 11). About 445 acres would be affected as a result of constructing of lifts, trails, glades, roads, and a food deck. Of that 445 acres, approximately 211 acres would actually be converted from various existing habitat types to graded ski trails and associated facilities. An additional 175 acres of forest would be gladed, thereby reducing the number of trees by about 30 percent. The conversion of 30 acres of aspen, 57 acres of spruce-fir, 170 acres of lodgepole pine, and 7 acres of mixed forest to ski trails and associated developments would reduce the availability of potential nesting, foraging, and wintering habitat for interior-forest species and snag-dependent species, while creating habitat for some grassland/meadow and edge-tolerant species (Table 4.8). The majority of the existing 158 acres of grassland/meadow and savannah habitat types affected by this alternative would not be altered as this area would only be skied over. However, compaction of snow by skiers and groomers could potentially act as a barrier to subnivean mammals such as pocket gophers, southern red-backed voles, and shrews. Snow compaction would also allow predators such as coyotes and bobcats to utilize these areas that would otherwise be unavailable to them due to deep, uncompacted snow.

Of the 175 acres to be gladed, approximately 24 acres would require little if any modification in forest canopy. Thus, 151 acres would be affected by initial and periodic glading which would create habitat for edge-tolerant species and herbivores that utilize open areas mixed with forest cover.

Approximately 35 acres of habitat would be cleared for the construction of roads and skiway/roads. These roads and skiways would increase forest fragmentation and decrease habitat available for forest-interior species. These effects would be most severe for the West Super Skiway/Road because it runs through old-growth spruce-fir forest.

4.3.4.1.3.1 Ridge Lift Pod

Trails associated with the Ridge Lift would provide 155 acres of skiable terrain, 15 of which would be naturally open whereas the remaining 140 acres would require habitat alterations. About half of this disturbance would be in the form of conventional runs, and half in gladed trails.

Table 4.8. Effects on habitat for several species within the PA							
SPECIES	Alternative						
	No Action	Center Ridge		Proposed Action		MDP	
Forest-Interior Species	Acres	Acres	% Change	Acres	% Change	Acres	% Change
Marten	1028	971	-6	865	-16	726	-29
Boreal Owl	1028	971	-6	865	-16	726	-29
Three-toed woodpecker	1028	971	-6	865	-16	726	-29
Golden-crowned kinglet	1028	971	-6	865	-16	726	-29
Lynx (denning habitat)	1028	971	-6	865	-16	726	-29
Goshawk (nesting)	292	0	0	0	0	228	-22
Southern red-backed vole	2048	1815	-11	1560	-24	1227	-40
Grassland/Meadow & Edge Habitat Species							
Deer/Elk (% cover:forage ratio)	68:32	61:39	± 7	55:45	± 13	46:54	± 22
White-crowned sparrow	983	1006	+ 2	1006	+ 2	1006	+ 2
Snowshoe hare	1351	1341	-1	1223	-9	1085	-20
Blue grouse	3424	3656	+ 7	3830	+ 12	4004	+ 17
Wilson's warbler	76	75	-1	70	-8	53	-30

Many of these runs would traverse a dense stand of lodgepole pine. This stand is comprised of a closed forest canopy with little understory diversity. Currently, relatively few bird species utilize this stand compared to other areas in the PA, presumably due to the lack of understory vegetation (Thompson 1994b). This lodgepole pine stand also provides relatively poor habitat for most mammals. A HSI analysis for snowshoe hare found this stand to be unsuitable for this species. The construction of ski trails through this habitat would likely increase understory vegetation diversity along edges, thereby creating habitat for edge-dependent species and herbivorous mammals such as the snowshoe hare. If so, feeding habitat for the lynx may also increase due to the fact that snowshoe hares are the preferred prey for this species.

4.3.4.1.3.2 *Super Bowl Pod*

Development of this pod would provide approximately 315 skiable acres, of which 235 would be natural runs requiring little or no development. About 34 acres of development would consist of conventional ski trails and the remaining 46 acres would be gladed. There would be an additional direct impact to a small portion of the above forested habitats through the installation of lift towers, terminals, and a food deck.

The adverse effects associated with development of this pod would occur primarily as a result of the construction of ski trails through old-growth spruce-fir stands at the top of Super Bowl. Although these trails would be gladed, they would fragment the second largest stand of old-growth on the PA. This fragmentation would undoubtedly reduce habitat for species adapted to old-growth forest such as boreal owls, three-toed woodpeckers, and lynx. In the case of lynx, this stand of old-growth represents suitable denning habitat. Additionally, ski trails 2H and portions of 2G' would traverse a lodgepole pine stand that is suitable for snowshoe hare, reducing potential hare habitat and, consequently, lynx feeding habitat by about 10 acres (Figure 4.14). The clearing of these trails would equate to a reduction of 10 habitat units for snowshoe hare within the PA (Pioneer 1995b).

Although some of the trails proposed in this pod would run through old-growth stands, 75 percent of the skiable acres would require little habitat manipulation. These trails would run through grassland/meadow, spruce-fir savannah, and lodgepole savannah habitats. The effects of these trails on wildlife would be minimal and consist mainly of increasing the compaction of snow by skiers and thus, possibly increasing the utilization of the areas by bobcat and coyote, which cannot travel through deep, uncompacted snow. Snow compaction by skiers may also impede the movement of subnivean mammals.

4.3.4.1.3.3 *Tea Cup Pod*

Development of this pod would provide approximately 26 additional skiable acres below Sleepytime Road, of which 19 acres would require development. About 14 acres of this development would consist of conventional seeded ski trails and the remaining 5 acres would be gladed. About 7 acres would be naturally open ski trails requiring little or no construction. An additional 2 acres would be cleared for the construction of lift towers and terminals.

Ski trails associated with this pod occur almost exclusively in aspen stands and grassland/meadow types. Removal of trees in this area would reduce hiding and calving cover for elk, which traditionally use this area on their way to summering grounds. However, given that about 6 percent of aspen used by elk for calving within the Tea Cup pod would require the removal of trees, it is unlikely that this would have a significant impact on the elk herd.

4.3.4.1.4 *Alternative C - Proposed Action*

Implementation of the Proposed Action would have substantially greater impacts on wildlife than those associated with the No Action and Center Ridge Alternatives. About 828 acres would be affected through direct removal or secondary effects due to the construction of lifts, trails, glades, utilities, roads, food decks, and a restaurant (MAP 12). About 354 acres would be converted from various existing habitat types to seeded ski trails and associated facilities. An additional 345 acres would be gladed, thereby reducing the number of trees by up to about 30 percent. The conversion of 22 acres of aspen, 88 acres of spruce-fir, 243 acres of lodgepole pine, and 29 acres of mixed forest would reduce the availability of potential nesting, foraging, and wintering habitat for forest-interior and snag-dependent species, while creating habitat for some edge-tolerant species (Table 4.8). The majority of the existing grassland/meadow and savannah habitat types would not be impacted from a wildlife

October 1995

KEY:

- Proposed Ski Lift
—Proposed Ski Trail

Snowshoe Hare Habitat

- Spruce/Fir
—Lodgepole

-Two Elk Creek
& other drainages

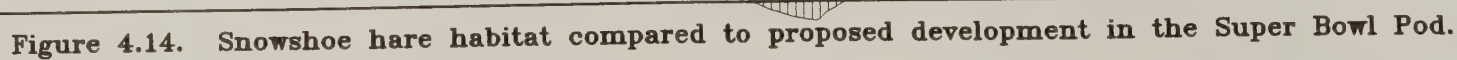


Figure 4.14. Snowshoe hare habitat compared to proposed development in the Super Bowl Pod.

standpoint, as this area would only be skied over. This would include approximately 12 acres of grassland/meadow required for a utility corridor from the top of Vail Mountain to the proposed restaurant.

Approximately 65 acres of habitat would be cleared for the construction of roads and skiways. These roads and skiways would increase forest fragmentation and decrease habitat available for forest-interior species. The effects would be most severe for Pete's Ridge, Upper East Pete's, and Pete's Bowl Skiway/Roads, because these run through old-growth stands of spruce-fir.

4.3.4.1.4.1 *Pete's Bowl Pod*

Development of this pod would provide approximately 295 skiable acres, of which 207 would require development. About 90 acres of development would consist of conventional ski trails and the remaining 117 acres would be gladed. Some of these trails start in old-growth stands of spruce-fir. Those trails associated with the Pete's Bowl proper, quickly leave the old-growth stands and traverse a variety of habitat types including spruce-fir savannah, mixed forest, and lodgepole pine stands. However, the majority of trails through East Pete's Bowl traverse old-growth spruce-fir stands.

Implementation of this pod would decrease the availability of habitat for interior-forest and snag-dependent species such as three-toed woodpeckers, boreal owls, northern goshawks, southern red-backed voles, and lynx by approximately 57 acres. Also, development of ski trails, skiways, and roads would result in clearing of 128 acres of suitable snowshoe hare habitat (Figure 4.15) resulting in a loss of 52 to 105 habitat units for this species (Pioneer 1995b). This clearing could reduce the snowshoe hare population in the area, thereby reducing the prey base for predators such as the lynx, coyotes, and avian predators.

In addition to the above impacts, the clearing of ski trails for this pod would result in the fragmentation of a 201-500 acre block of old-growth spruce-fir forest. These effects would primarily occur in East Pete's Bowl where a relatively large stand of old-growth spruce-fir is located. Development of trails associated with Pete's Bowl proper would have considerably fewer effects on forest-interior species relative to those in East Pete's. This is because the majority of disturbance associated with these trails would be due to glading in spruce-fir savannah, grassland/meadow, mixed forest, and lodgepole pine stands. Few to no trees would be removed in the grassland/meadow and spruce-fir savannah types, resulting in minimal habitat alterations in these areas.

Currently, understory vegetation in the dense, closed-canopy lodgepole pine stand at the base of Pete's Bowl is limited to grouse whortleberry and elk sedge. Consequently, the value of this stand for wildlife is limited. Glading trails in this stand would open the upper canopy and increase production of mid and understory vegetation along the edges of ski trails. If this were to occur, foraging habitat for herbivorous animals and the predators that depend on them would increase.

Additional impacts associated with the implementation of this pod would result from the construction of Pete's Bowl Road and Skiway (7 acres) and Pete's Ridge Road (6 acres). These actions have the potential to decrease habitat for interior-forest species and increase habitat for edge-dependent species.

4.3.4.1.4.2 *Ridge Lift Pod*

Effects on wildlife resulting from implementation of this pod would be identical to those incurred from the development of Ridge Lift Pod described in the Center Ridge Alternative.

4.3.4.1.4.3 *Super Bowl Pod*

Effects on wildlife resulting from implementation of this pod would be identical to those incurred from the development of Super Bowl Pod described in the Center Ridge Alternative.

4.3.4.1.4.4 *Tea Cup Pod*

Effects on wildlife resulting from implementation of this pod would be identical to those incurred from the development of Tea Cup Pod described in the Center Ridge Alternative.

4.3.4.1.5 Alternative D - MDP Alternative

This alternative involves extensive development of the PA and, relative to the other alternatives, would have the greatest impact on wildlife. About 1,319 acres would be affected either directly or in a secondary manner, due to the construction of lifts, utilities, trails, glades, roads, food decks, and a restaurant (MAP 13). About 571 acres would be converted from various existing habitat types to seeded ski trails and associated facilities. An additional 492 acres would be gladed, thereby reducing the number of trees by about 30 percent. The conversion of 32 acres of aspen, 302 acres of spruce-fir, 353 acres of lodgepole pine, and 166 acres of mixed forest to ski trails would reduce the availability of potential nesting, foraging, and wintering habitat for interior-forest species and snag-dependent species, while increasing habitat for edge-tolerant species (Table 4.8). The reduction of snags and downed timber would reduce some denning habitat for marten. On the other hand, there will be increases in foraging habitat associated with the creation of forest/meadow edges. The majority of the existing grassland/meadow and savannah habitat types would not need to be altered to provide for skiing in these areas.

About 23 acres or 31 percent of the existing willow riparian habitat within the PA would be affected through implementation of this alternative. The primary type of impact would involve trimming riparian vegetation without disturbing the soils. These impacts would eliminate potential breeding habitat for species such as Wilson's warbler (Table 4.8) that require the woody structure that this vegetation type provides.

Initial and periodic glading would have the potential to remove or adversely affect essential habitat for snag-dependent and forest-interior species. Although this action calls for 617 acres of forest to be gladed, approximately 120 acres of this total would require little or no tree removal because the current density of trees meets gladed trail guidelines. Thus, 497 acres would require the removal of trees by glading. The creation of gladed trails would create habitat for edge-tolerant species (e.g., olive-sided flycatcher, mountain bluebird, hairy woodpeckers) and herbivores (e.g., elk, deer, montane vole, western jumping mouse) that utilize seeded ski trails mixed with forest cover.

Approximately 116 acres of habitat would be affected for the construction of skiway/roads, utilities, and buildings. Approximately 65 of those 116 acres would be located in forested habitats. Construction within those 65 acres would increase forest fragmentation and decrease habitat available for forest-interior species. These effects would be most severe for Pete's Ridge, West Super, Upper East Pete's, and Pete's Bowl Skiway/Roads because portions of these would occur in old-growth stands of spruce-fir.

The disturbance to wildlife associated with the construction phase of this project would be greatest under the MDP Alternative. Construction would require 5 to 7 years, during which time extensive logging, trail and road grading, and building activity would occur throughout the PA (VA 1994a). These activities would displace certain wildlife from the PA, at least on a temporary basis. Individuals of species that are capable of moving to adjacent suitable habitat in the LA (e.g., elk, deer, boreal owls, goshawks, etc.) would most likely do so until the

construction phase is completed. Following construction, these animals would likely begin to slowly reoccupy vacated habitats. However, individuals of species that are less mobile (e.g., southern red-backed vole, red squirrel, northern pocket gopher, snowshoe hare, etc.) would most likely be displaced into unoccupied suboptimal habitats within the PA. Mortality of these individuals can be expected to be high and result in population reductions which may be temporary or permanent depending how well and in what form the disturbed areas are revegetated.

4.3.4.1.5.1 *Commando Bowl Pod*

This pod would provide approximately 578 skiable acres, of which 71 acres would be natural runs requiring little or no development. About 184 acres of development would consist of conventional ski trails and the remaining 323 acres would be gladed. There would be additional direct impacts to a small portion of the above forested habitats due to the installation of lift towers and terminals (9 acres).

Development of this pod would have the greatest impact on wildlife relative to any of the other proposed pods. Most of the trails would either originate, transect, or would be completely contained in the largest block of mature and old-growth spruce-fir forest in the PA. Fragmentation of this area with ski trails would decrease the available habitat for numerous dense/mature forest-dependent species (e.g., boreal owl, northern goshawk, southern red-backed vole, golden-crowned kinglet, lynx), while increasing habitat availability for edge-dependent and early successional, stage species (e.g., elk, deer, bear, white-crowned sparrows).

Snowshoe hare habitat (Figure 4.16) would probably be reduced by 138 acres due to the development of ski trails, skiways, and roads through suitable habitat, resulting in a loss of 56 to 121 habitat units (Pioneer 1995b). This could also have secondary implications for predators such as lynx and goshawk, which use snowshoe hare as a food source.

In contrast, the construction of gladed trails through the dense mixed forest and lodgepole pine stands of East Pete's and Pete's bowls may increase habitat for numerous species of wildlife. Pre-development inventories documented little use of these areas by wildlife, presumably because of the dense canopy and subsequent lack of diverse understory vegetation. Thus, glading trails in these habitats would open the upper canopy, and increase understory vegetation and structural diversity. These changes would create foraging habitat for edge-dependent species and herbivorous mammals such as chickadees, pocket gophers, montane voles, mule deer, and elk.

4.3.4.1.5.2 *Super Bowl Long Pod*

This pod would provide approximately 353 skiable acres, of which 55 acres would be comprised of naturally open runs requiring little or no development. About 131 acres of development would consist of conventional seeded trails and the remaining 166 acres would be gladed. There would be an additional direct impact to a small portion of the above forested habitats through the installation of lift towers, terminals, and a food deck.

The overall, long-term effects of development of this pod on wildlife may be beneficial. The majority of these ski trails traverse a dense, mature lodgepole pine stand that currently supports relatively little wildlife. Opening this closed canopy would increase understory vegetation and, consequently, increase the use of this area by wildlife. Ski trails through these dense lodgepole pine stands should improve foraging habitat for snowshoe hare once shrubby vegetation becomes established along the edges. The lynx should also benefit from the development of these trails because snowshoe hare is its primary food source. The relatively low numbers of snowshoe hare currently in the PA and LA, and specifically in these mature lodgepole pine stands, may limit the value of these areas as feeding habitat for lynx. An exception would be ski trails 2G' and 2H, which would traverse a stand of

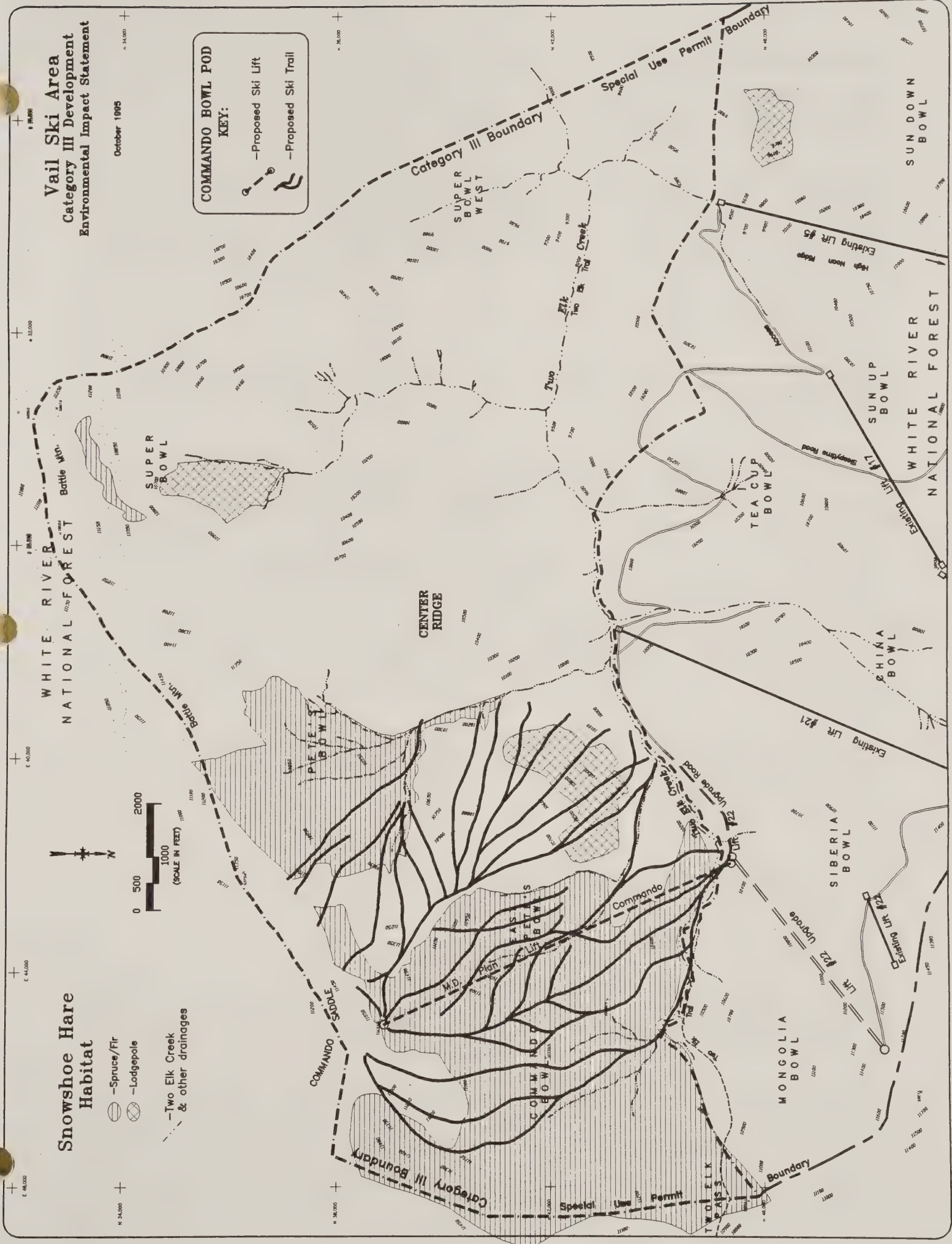


Figure 4.16. Snowshoe hare habitat compared to proposed development in the Commando Bowl Pod.

lodgepole pine currently suitable for snowshoe hare (Figure 4.17). Development of these trails could result in a loss of 10 habitat units for snowshoe hare (Pioneer 1995b).

The most important impacts to wildlife resulting from the development of this pod would be the fragmentation of a stand of old-growth spruce-fir habitat within the anticipated route of the West Super Skiway/Road and the associated trails at the top of Super Bowl. Fragmentation of this stand has the potential to reduce habitat for forest-interior and snag-dependent species, particularly denning habitat for the lynx. Other species such as the southern red-backed vole, red squirrel, snowshoe hare, and boreal owl would also experience habitat losses as well.

4.3.4.1.5.3 *Super Bowl West Pod*

This pod would consist of 188 acres of skiable terrain, of which 84 acres would be conventional trails, and 104 acres would be gladed trails. There would be additional direct impacts due to the installation of lift towers and terminals (8 acres).

The proposed trails would primarily run through spruce-fir, mixed forest, lodgepole pine, and grassland/meadow habitats. Trails running through the mixed forest and spruce-fir habitats would result in fragmentation of these habitats, thereby decreasing available habitat for forest-interior species and increasing habitat for edge-tolerant species. Predators such as coyotes and bobcats may benefit from these ski trails, because the compaction of snow by skiers would allow these species to access areas that are usually inaccessible due to deep, uncompacted snow. About 88 acres of trails would traverse lodgepole pine forest, and may increase the value of this habitat by increasing understory vegetation. In particular, snowshoe hare and lynx feeding habitat may be improved. Edges of ski trails would eventually support a shrubby understory component and, thus, increase habitat suitability for hares. Consequently, lynx, which rely on snowshoe hare as a food source, should also benefit from these trails. Increasing the value of lodgepole pine stands in the PA for lynx feeding habitat is also beneficial because of the close proximity of these stands to suitable lynx denning habitat in the old-growth spruce-fir stands along the top of Super Bowl.

About 64 acres of potential nesting habitat for the northern goshawk would be affected through implementation of this pod. Goshawk have not been observed in this area since before 1989, however, an inactive nest is still located in this drainage (Figure 4.18).

4.3.4.1.5.4 *Tea Cup Pod*

Effects on wildlife resulting from implementation of this pod would be identical to those incurred from the development of Tea Cup Pod described in the Center Ridge Alternative.

4.3.4.1.5.5 *Lower Sun Down Pod*

There are three ski trails and a short lift associated with this pod. These would account for 30 acres of disturbance, mostly in aspen/conifer, mountain brush, and grassland/meadow habitats. Also associated with this pod are the West Skiway and the Lower Lift 5 Skiway/Road. These would account for three acres of disturbance, primarily through aspen, aspen/conifer, and grassland/meadow habitats.

Effects of the Lower Sun Down Pod developments to wildlife would most likely be greatest on herbivorous mammals using these habitats. For example, about 23 acres of elk calving habitat would be eliminated due to the removal of trees and shrubs in this pod. However, given that the trails are short and that few trees would need

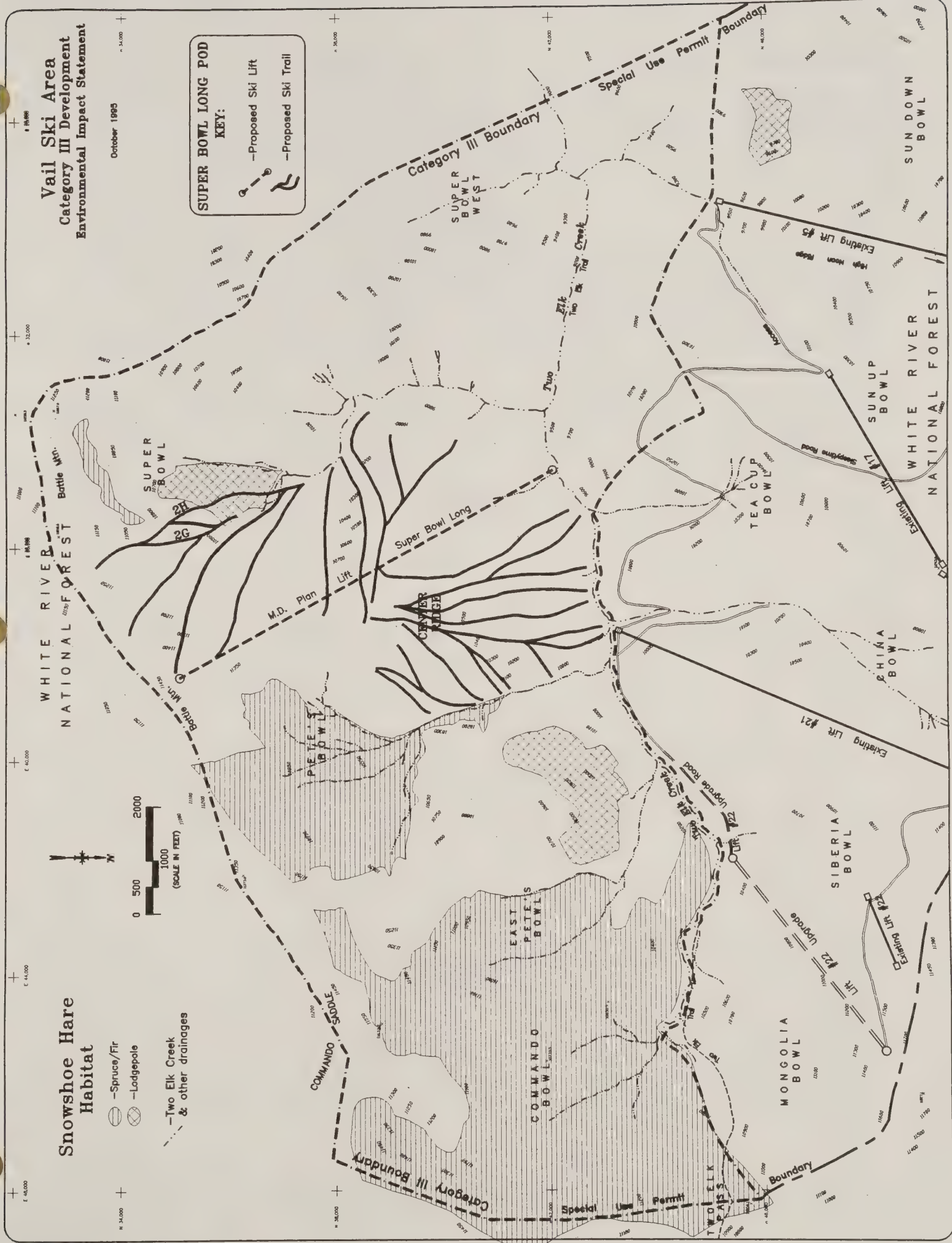


Figure 4.17. Snowshoe hare habitat compared to proposed development in the Super Bowl Long Pod.

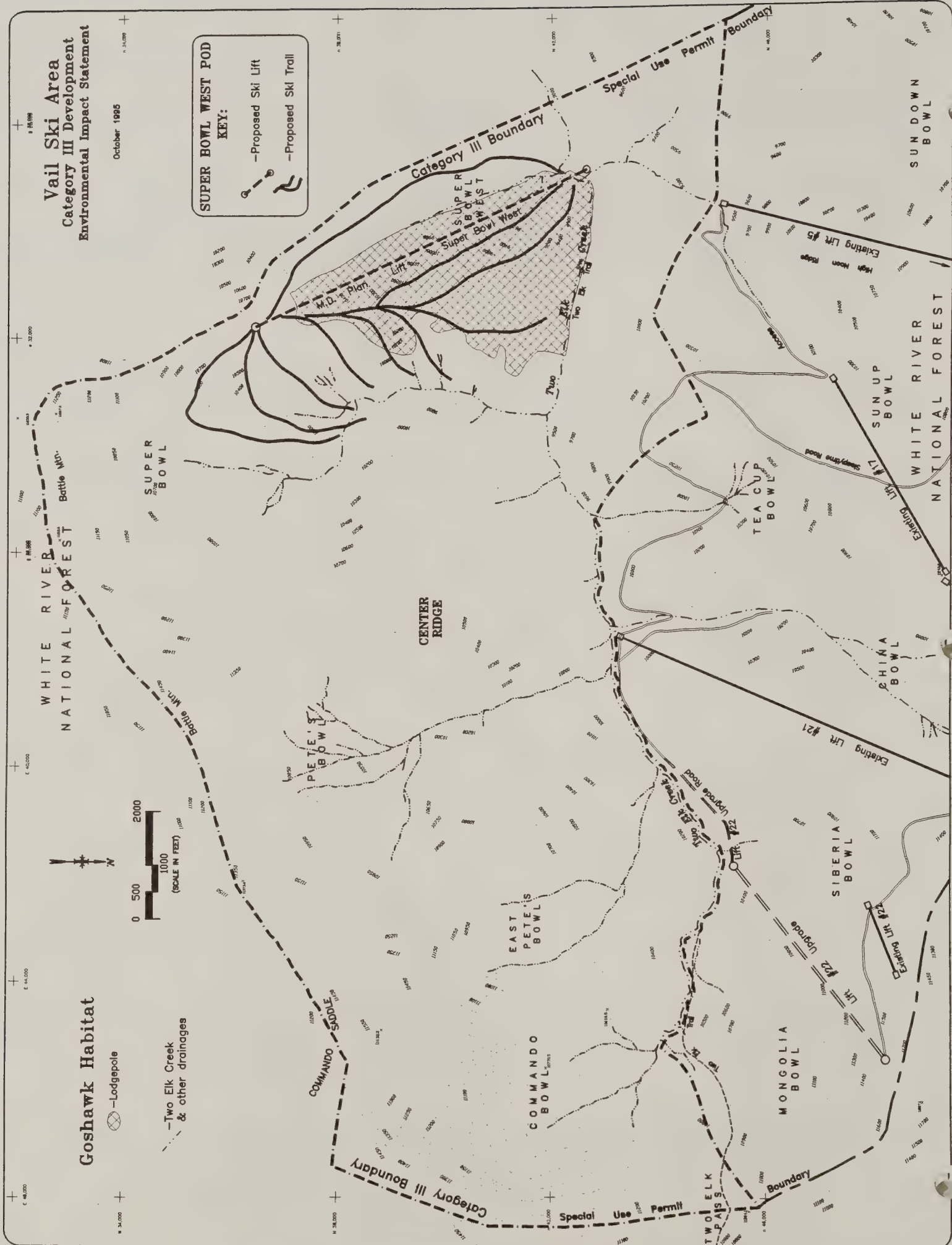


Figure 4.18. Goshawk habitat compared to proposed development in the Super Bowl West Pod.

to be removed to establish them, losses to elk calving habitat would be minimized. However, increased snow compaction by skiers and grooming machines could decrease the suitability of these areas for subnivean mammals in winter. Also, the compacted snow may allow greater access to these areas by predators such as bobcat and coyote, possibly subjecting small mammals to increased predation rates.

4.3.4.2 Potential Mitigation Measures

A discussion of standard mitigation measures and potential mitigation measures that are project- and impact-specific for wildlife are discussed in Table 2.11, which summarizes each mitigation measure, noting its anticipated effectiveness and the entity responsible for authorizing and implementing it. In Table 2.11 the types of impacts identified include: 1) direct loss of habitat or impairment (fragmentation); 2) loss of habitat function because of human disturbance, intrusion, access, and activity in the PA; 3) creation of nuisance bear situations; and 4) displacement of wildlife to adjoining habitats. There are 33 separate mitigation measures identified in Table 2.11. The ones that appear to have the highest probability of being effective include: 1) creating forest debris habitat using slash from construction activities; 2) reducing or eliminating disturbance through temporal and spatial avoidance; 3) reducing fragmentation of large forested blocks through consolidation of ski facilities; 4) avoiding or minimizing areas with especially high habitat value; 5) maintaining closure of China Bowl to avoid disturbance of elk during calving; 6) controlling food, waste, and garbage to reduce the potential for creating bear nuisances; and 7) obliterate, recontour, and make impassable the optional Lime Creek logging road after it is no longer needed.

4.3.4.3 Unavoidable Adverse Impacts

Several adverse impacts to wildlife are unavoidable and cannot be mitigated. These include loss of forested and forest-interior habitats for species dependent on these vegetation types. Of particular concern are losses occurring in old-growth spruce-fir stands, which would decrease habitat for lynx, marten, boreal owls, three-toed woodpeckers, golden-crowned kinglets, and other wildlife associated with this successional stage. The overall result of these habitat manipulations would be to reduce the value of the PA to many forest-interior species.

The temporary and permanent displacement of animals from the PA would likely occur from the development of any of the action alternatives. Temporary and permanent displacement of individuals would also occur from the increased human/wildlife interactions during winter and summer from all the alternatives, including the No Action Alternative. Mortality of individuals would likely occur directly from construction activities and indirectly from displacement of animals from their home ranges.

4.3.4.4 Cumulative Impacts

Loss of wildlife habitat through residential development and increased human disturbance in the LA and RA are probably the greatest threats to the viability of wildlife populations. Development of existing habitat on and off public lands would displace all species except those tolerant of such developments (e.g., American robin, hairy woodpecker, western jumping mouse). Of particular concern in the Vail area is the potential development of the western portion of Battle Mountain, east of Highway 24 near Gilman. This potential development would be located on private land, approximately 1 mile southwest of the PA boundary near Super Bowl. Construction of this development would probably fragment several large blocks of lodgepole pine and spruce-fir forest, effectively eliminating a substantial quantity of habitat for forest-interior species as well as for edge-tolerant species that would not be capable of tolerating the constant presence of humans. Although this area was not inventoried for

wildlife, the vegetation types that occur there have the potential to provide suitable breeding or transitional habitat for goshawk, flammulated owls, boreal owls, blue grouse, marten, snowshoe hare, lynx, bear, deer, and elk.

Residential development of private land in the Gilman-Red Cliff area would likely increase human/wildlife interactions with black bear and elk. Black bear often become accustomed to the presence of humans and are often attracted to garbage and other potential food sources. Any bears currently using the area may be attracted to this proposed development, potentially resulting in human/bear conflicts.

In fall, some elk utilize the site of the western Battle Mountain area as a portion of their migration route to winter range. The lower elevations of this area are also used by elk as winter range during severe winters, and aspen and meadow areas most likely serve as calving grounds for some elk. Developments in these areas would increase elk/human interactions in severe winters, and most likely make this area unsuitable as a calving ground. Furthermore, development of this site would likely force animals to use a narrower migration route between Game Creek and Two Elk Creek.

Increased urban developments such as those in the Battle Mountain area and other properties in the LA would increase vehicular traffic on Highway 24 and I-70. This increased traffic would likely increase the number of vehicle/wildlife collisions occurring when wildlife attempt to cross these highways.

Timber harvest has occurred, is currently being conducted, and is planned on the National Forest on several areas within the LA and RA. Portions of the Turkey Creek drainage have been harvested through a variety of silvicultural techniques, including clear cutting. Similar harvest has occurred in the Lime Creek and Timber Creek drainages, although to a lesser degree. Harvest of some stands has reduced the available habitat for forest-interior species (e.g., goshawks, three-toed woodpeckers, boreal owls, marten, and southern red-backed voles), and some future operations would continue to decrease habitat for these species. Two portions of the LA in which timber harvest in old-growth stands has the potential to be harmful to forest-interior species, are the Timber Creek and Lime Creek drainages. Timber harvest could occur in previously harvested stands in these same drainages without affecting forest-interior species. However, intensive habitat alterations in older (not recently cut) spruce-fir stands would adversely affect forest-interior species, particularly the northern goshawk, lynx, and boreal owl. Conversely, under certain conditions, forest management could be designed to enhance the habitat of the elk, deer, snowshoe hare, and lynx.

With the exception of the direct effect of habitat loss from human developments, the indirect effect of disturbance to wildlife from recreationists is the biggest threat to the population viability of many species of wildlife in the LA. Winter and summer recreation in the LA and RA adversely impact those species that are intolerant of such disturbance (e.g., goshawk, lynx, denning bears). Projected increases in winter and summer recreation (Chapter 4: Recreation) suggest that disturbance to wildlife would increase with or without any future developments. Increased access to the area from the construction of logging roads and new trails, and the encroachment of urban developments, would accelerate the increase in recreation within the LA and RA.

Additional information on the effects of the proposed alternatives on candidate and Forest Sensitive species is provided in the BE prepared in conjunction with this Draft EIS. The BE evaluates the effects of the proposed alternatives on individuals of these species and their habitats, and provides determinations on their future population status. The BE indicates that although individual sensitive and candidate species may be adversely affected, population viability can be maintained.

4.3.5 BIODIVERSITY

4.3.5.1 Direct and Indirect Impacts

4.3.5.1.1 Impacts Common to all Action Alternatives

Land management can have positive, negative, or neutral effects on biodiversity. Management may have positive effects on biodiversity if it protects or improves biodiversity, negative effects if it results in a loss of biodiversity at any level (see Chapter 3, Biodiversity), and neutral effects if it mimics natural processes and community patchiness. Under current Forest Service Policy, NFS lands are managed for biological diversity under the Ecosystem Management Approach. The goal of this approach is to sustain (or restore) the diversity, resilience, and future productivity of Forest Service lands.

Increasing the diversity of habitat types may increase the number of species present, provided that the resultant habitat patches are of sufficient size and quality to maintain viable populations of native species. However, the types of species present (i.e., forest-interior vs. edge-tolerant) and the abundance of individuals within a given species may actually decrease with increased habitat patchiness (Norse 1990). For example, the abundance of cavity-nesting birds, and other species that depend on standing- or downed-dead trees to complete all or part of their life cycle, would be reduced if habitat alterations decreased the number of snags and downed logs. Furthermore, if such habitat alterations are severe enough (e.g., removal of substantial quantities of snags and logs) some species may be eliminated from the area.

With reference to ski areas, habitat alterations generally result in forest fragmentation through the creation of maintained ski trails and associated facilities. Consequently, populations of relatively common edge-tolerant species that utilize grasslands and open forests (e.g., broad-tailed humming bird, mountain bluebird, white-crowned sparrow, dark-eyed junco, montane vole, northern pocket gopher, least chipmunk, deer, elk) generally increase. Most of these species, however, are ubiquitous and in little danger of extirpation. Alternatively, populations of relatively rare forest-interior species (e.g., golden-crowned kinglet, three-toed woodpecker, brown creeper, red-breasted nuthatch, southern red-backed vole, lynx) tend to decrease because of the decreasing availability of suitable habitat. Thus, the best management strategy for conserving populations of forest-interior species would be to maximize the amount of contiguous forest area.

Potential decreases in biodiversity from the creation and maintenance of ski trails would not be limited to birds and mammals. Removal of woody vegetation, snags, and debris would result in changes to mycorrhizal fungi associations, nonvascular plants, algae, and bacteria, and complex changes in soil biology and changes in soil structure (Franklin et al. 1981, Maser et al. 1988, Noss and Cooperrider 1994). A decrease in invertebrate species would also be expected (McIver et al. 1990, Moldenke and Lattin 1990, Schowalter 1990).

Biodiversity, as measured by plant species richness within habitat types (i.e., alpha diversity), would potentially decrease in areas where proposed activities such as clearing trails, grading, and direct construction work persist through time. For example, although mitigation efforts may specify revegetation with native plant species, the revegetated areas would almost never contain the same vegetation that was present prior to the disturbance. This is because much of the vegetation would be converted from the pre-disturbance (often forested) types to seeded, open meadows suitable for skiing. Although these areas may still contain some native plant species, they would be dominated by common grass species. Consequently, populations of these species would substantially increase over predisturbance levels. In contrast, populations of the more uncommon plant species, such as those occurring in the understory of the moist, densely forested habitats in Commando and East Pete's Bowls (MAP 8), would

likely decrease substantially. Additionally, even with rapid revegetation and phased disturbances, invasion of disturbed areas by noxious, usually non-native, weedy plant species is likely. Any weedy species that become established would further decrease native plant species biodiversity because weeds commonly out-compete and eventually replace native species if not properly controlled. Furthermore, although revegetated areas may contain native plant species, the source of the seeds and/or shoot material would not likely be from local populations. The introduction of new genes to these populations, and the resulting augmentation of genetic variation to native plant strains, would potentially result in changes to plant biodiversity at the genetic level. The potential effects of this augmentation on native (local) allele frequencies are not known.

Potential changes to biodiversity were assessed at the PA, LA, and RA scales. This three-tiered approach allowed for quantitative and qualitative assessments of the effects of various alternatives on biodiversity. Organisms generally require a minimum habitat block size to meet life history requirements. Some species, such as the southern red-back vole, require relatively small block sizes (e.g., one acre), while other species, such as the marten, require relatively large block sizes (e.g., 400 acres or more). Fragmenting large blocks of forest can impact habitat suitability for species dependent on large areas of interior forest. Potential changes in biodiversity that could result from implementation of the Proposed Action and its alternatives were estimated through an analysis of predicted changes in forest block size. In this analysis, the relative abundance of four forest block size classes were compared among alternatives. These classes included 0 to 5-acre, 6 to 50-acre, 51 to 200 acre, and 201 to 500-acre forest block sizes (Appendix D: Biodiversity).

4.3.5.1.2 Alternative A - No Action

Under the No Action Alternative, no development of ski facilities would occur in the PA. Consequently, there would be no effect to biodiversity on the spatial scale of the PA resulting from such development. At the LA and RA scales, known and unknown effects would continue, including those associated with Vail Ski Area operations and maintenance. On-going front side and Back Bowls effects, including further forest fragmentation, would continue to affect biodiversity on the scale of the LA.

It is important to note that, despite the fact that CAT III would not be developed under this alternative, natural succession and disturbance (e.g., fire and avalanche) along with human-generated disturbances occurring outside of the PA (e.g., logging, commercial and private development, and road construction) will continue to shape biodiversity at each of the three spatial scales (PA, LA, and RA) by influencing the vegetation structure present, the proportions in which they occur, and the movement of animals in and out of these areas. Historically, disturbance processes have interacted to produce a range of variation of habitats and associated organisms in the area. For example, spruce-fir stands undergoing low-intensity, frequent disturbances (e.g., tree falls) would persist as mature and old-growth forests. These habitats provide suitable nesting/denning conditions for boreal owls, three-toed woodpeckers, goshawks, lynx, and marten. Data from existing stands suggest that disturbance and natural succession has resulted in as much as 35 to 45 percent of the LA being in mature spruce-fir cover, and 10 percent to greater than 13 percent in old-growth spruce-fir in the past (Buell, *pers. comm.*, 1995). Currently, 33 percent of the LA is in spruce-fir and eight percent in old-growth. In the absence of any catastrophic crown fires, mountain pine beetle outbreaks, or large timber sales, these percentages may be expected to increase over time.

Under high-intensity, moderate-frequency disturbances (e.g., hot ground fires), spruce-fir forests are likely to be converted to and maintained in lodgepole pine cover types. Following establishment, lodgepole pine stands move through a range of structural stages starting from a grass/forb stage and ending in mature or old-growth stages depending on the frequency and intensity of disturbance. Interpretation of historic stand data suggests that at any one time, 25 to 30 percent of the LA is likely to be in lodgepole pine stands of various structural stages (e.g., 0 to

10 percent grass/forb, 25 to 35 percent mid-seral, 40 to 50 percent mature, 0 to 5 percent old-growth) (Buell, *pers. comm.*, 1995). These stands provide habitat for numerous species of wildlife with the species composition of a given stand depending largely on the structural stage it is in. As a stand changes with succession and/or disturbance, the wildlife populations that utilize it will fluctuate to some extent as well. At present, lodgepole pine forest comprises 30 percent of the LA, and old-growth lodgepole represents less than one percent. Given that the current proportion of mature lodgepole is relatively high and fire suppression efforts will likely continue, one would expect a gradual loss of lodgepole pine in the area as a result of succession to spruce-fir.

Aspen habitats may result when forests are subjected to high-intensity, moderate to low-frequency disturbances (e.g., avalanches or hot, crown fires in areas that have supported aspen in the past). Aspen stands generally comprise 10 to 20 percent of the LA and occur in a variety of structural stages analogous to those of lodgepole pine (Buell, *pers. comm.*, 1995). Just as for lodgepole, the wildlife and plant species that utilize these stands tend to be associated with certain structural stages. Thus, population fluctuations would be expected to occur as the proportions of the various stages change over time across the landscape. Currently, aspen stands account for 16 percent of the cover types within the LA. Given that aspen stands are maintained by disturbance, the relative abundance of aspen habitats in the PA, LA, and RA may either decline if, under decreased disturbance intensities spruce and fir are able to become established in these stands, or they may increase if natural and/or anthropogenic disturbances encourage aspen regeneration.

Very intense fires are also within the natural range of variation in the LA. In such events, seed sources along with soil organic matter may be destroyed. As a result, it can take hundreds of years for such areas to regain forest cover. A fire of this type around the turn of the century is responsible for the large, open meadows that currently characterize the Back Bowls. As this example illustrates, natural patterns of disturbance and succession result in a dynamic, "shifting mosaic" of habitat types across the landscape. Again, to the extent that the distribution and abundance of a given habitat type or structural stage fluctuates over time across a landscape, populations of species that depend on those types are likely to fluctuate to some extent as well.

4.3.5.1.3 Alternative B - Center Ridge

Implementation of this alternative would result in development of three pods, Super Bowl, Ridge Lift, and Tea Cup (MAP 11). Of the action alternatives, Center Ridge would have the fewest effects on biodiversity. About 211 acres of forested habitats would be converted to grassland/meadow habitat through the construction of conventional trails and roads. This would increase the proportion of non-forested habitat from 21 to 25 percent within the PA and, subsequently, increase the amount of edge habitat and forest fragmentation. This fragmentation would result in a decrease from four to two of the 201 to 500-acre size forest blocks (one each of spruce-fir old-growth and lodgepole pine), and an increase of 169, 0 to 5-acre and fifty one 6-50 acre forest blocks (Figure 4.21). In so doing, the large (201 to 500-acre) forest blocks, which currently comprise 47 percent of the total forested acreage within the PA, would only comprise 20 percent (Figure 4.20). Alternatively, small forested blocks (0 to 5 and 6 to 50-acres), which currently comprise 17 percent of the total forested acreage within the PA would increase to 46 percent. Also, approximately 175 acres of forested stands would be gladed. Although not as drastic a change as that associated with the construction and maintenance of conventional trails, glading would further reduce the quantity of interior-forest habitat. This alternative would not affect Commando, East Pete's, or Super Bowl West Bowls. However, a small portion of the west side of Pete's Bowl would be impacted.

The overall effect of such habitat manipulations would be to increase the patchiness of habitat types and decrease the acreage of forest stands in the western one-third of the PA. The results of increasing habitat patchiness would be changes in species composition and diversity. For example, fragmentation of large, interior-forest blocks

through the construction and maintenance of ski trails would provide habitat for edge-tolerant species (e.g., deer, elk, montane vole, white-crowned sparrow) in areas that these species do not currently occur. Forest-interior species (e.g., marten, red-backed vole, golden-crowned kinglet), however, are relatively sensitive to habitat manipulations and the large tracts of contiguous forest that provide habitat for these species are steadily declining. Thus, the effects of such habitat manipulations at the scale of the PA would likely be increased population sizes for edge-tolerant species with little or no change in the number of these species present, and decreases in both population sizes and the number of forest-interior species present (Temple 1986, Buskirk and Ruggiero 1994, Lyon et al. 1994). An overall decrease in species diversity within the PA is therefore likely to occur as a result of the habitat manipulations associated with this and the other action alternatives.

4.3.5.1.3.1 Ridge Lift Pod

Development of this pod would result in 52 acres of lodgepole pine, 4 acres of spruce-fir, 9 acres of aspen/conifer, 2 acres of aspen, and 12 acres of mixed savannah being converted to conventional seeded ski trails. Although most inter-trail forest blocks created in this pod through the construction of conventional ski trails may be too narrow to provide interior-forest habitat for some species, only five of the 16 ski trails would be conventional. The remainder of the trails would be gladed and interspersed between the conventional trails. Thus, even though the forested habitat affected by this pod would be fragmented, the majority of this fragmentation would result from glading (i.e., removal of no more than 30 percent of the existing trees). Therefore, functional habitat for interior-forest species may be partially retained. At the same time, fragmentation of the large stand of lodgepole pine at the base of Pete's and Super bowls, would increase habitat for edge-tolerant species. Presently, few wildlife species utilize this stand, presumably due to the lack of mid- and understory components within it. Thus, creation of ski trails through this stand may increase species richness without compromising species composition.

4.3.5.1.3.2 Super Bowl Pod

Development of this pod would create nine trails in Super Bowl, of which two would be conventional and the remainder would be gladed. Thus, 54 acres of currently forested land would be converted to open grassland/meadow habitat due to the construction of trails and a lift. Also, 41 acres would be gladed, of which seven would occur in savannah types requiring little or no tree removal.

The construction of ski trails and the West Super Skiway/Road at the top of Super Bowl would fragment a 201-500 acre old-growth spruce-fir stand, leaving one large (201 to 500-acres) old-growth block in the PA (Figure 4.21 and 4.22). Development of this pod would also result in a 50 percent reduction of the total acreage of forested land in the 201 to 500-acre block size class (Figure 4.20). Consequently, habitat for old-growth/forest-interior species would be reduced. Specifically, 12 acres of this stand would be converted to conventional ski trails, while 27 acres would be gladed.

4.3.5.1.3.3 Tea Cup Pod

The forested habitats affected by development of this pod would be aspen, aspen/conifer, and lodgepole savannah. All of these types, with exception of the aspen type, occur in relatively small patches. A comparatively large stand of aspen extends from near the proposed Tea Cup Lift, west to the Lower Sun Down area. Interspersed within this stand are a number of relatively small areas of rock/scree, aspen/conifer, and grassland/meadow types. The naturally open canopy and patchiness of aspen habitats, make this area more important for edge-tolerant species than forest-interior species. This conclusion was confirmed by the breeding bird surveys, which documented use of this area by only edge-tolerant species (i.e., broad-tailed hummingbird,

northern flicker, American robin, dark-eyed junco) and by the traditional use of this stand by elk as a calving area. Thus, the effects of four ski trails (two conventional and two gladed) and the Tea Cup Skiway/Road on continuity of this large aspen block would have little effect on species richness or abundance.

4.3.5.1.4 Alternative C - Proposed Action

Implementation of this alternative would entail changes to biodiversity at the species and community or habitat level. These changes would occur due to the increase in extent of maintained, grassland/meadow habitat and the corresponding decrease in contiguous, closed-canopy forest blocks that currently exist. About 354 acres of forested habitats would be converted to grassland/meadow habitat through the construction of conventional trails (MAP 4). This would increase the proportion of non-forested habitat from 21 percent to 28 percent within the PA, thereby increasing the amount of edge-habitat and forest fragmentation. Also, approximately 323 acres of forested land would be gladed, further reducing the quantity and quality of interior-forest habitat, although to a lesser degree than in forest areas converted to seeded ski trails. The overall effect of such habitat manipulations would be to increase the patchiness of habitat types through fragmentation and decrease average stand size and total forest acreage.

This alternative includes those developments associated with the Center Ridge Alternative, with the addition of further developments in Pete's and East Pete's Bowls. Thus, changes in biodiversity, as indicated by habitat block size, would not be appreciably different than those changes discussed for the Center Ridge Alternative (Figures 4.19 through 4.22). Habitat fragmentation would primarily result from the conversion of two, 201 to 500-acre forest blocks (one old-growth spruce-fir and one lodgepole pine) to smaller 0 to 5 and 6 to 50-acre blocks. Consequently, large (201 to 500-acre) forest blocks, which currently comprise 47 percent of the total forested acreage within the PA, would only comprise 20 percent under the Proposed Action (Figure 4.20).

Conversely, small forested blocks (0 to 5 and 6 to 50-acres), which currently comprise 17 percent of the total forested acreage within the PA would increase to 51 percent. Additionally, ski trails through East Pete's Bowl would result in fragmentation of the largest block of old-growth spruce-fir within the PA. Although the resulting block size of this old-growth stand would still be greater than 200 acres, development through this area of East Pete's Bowl would affect suitable lynx/snowshoe hare habitat. Additionally, development in this area would affect habitat of other old-growth dependent species, such as the boreal owl and marten, and potentially disturb a unique forested wetland that occurs in upper East Pete's Bowl (see Chapter 4, Wetlands).

4.3.5.1.4.1 Pete's Pod

Implementation of this pod would convert 41 acres of old-growth spruce-fir, 30 acres of mature spruce-fir, 23 acres of mixed spruce-fir/lodgepole, 41 acres of lodgepole pine, 19 acres of spruce-fir savannah, and 11 acres of aspen/conifer to conventional ski trails and associated roads and facilities. This would increase open, non-forested areas by approximately 16 percent. Additionally, gladed trails through forested stands would convert 146 acres to savannah types, increasing these by 36 percent. The outcome of such manipulations would inevitably reduce habitat for interior-forest species and increase habitat for the more ubiquitous edge-tolerant species, thereby decreasing overall species richness in the PA.

Although trail, lift, and skiway/road development would essentially eliminate all forest blocks greater than 300 feet wide in East Pete's Bowl and the western half of Pete's Bowl, no developments would occur in Commando Bowl. This would maintain the integrity of a significant portion of the largest block of old-growth forest within the PA. Whereas habitat for species such as lynx, marten, southern red-backed vole, northern goshawk, and three-toed woodpecker would be preserved in Commando Bowl under this alternative, the portion of this old-growth stand that continues into East Pete's Bowl would still be impacted by the development of Pete's pod. Of particular concern are the unique forested wetlands that occur throughout East Pete's Bowl.

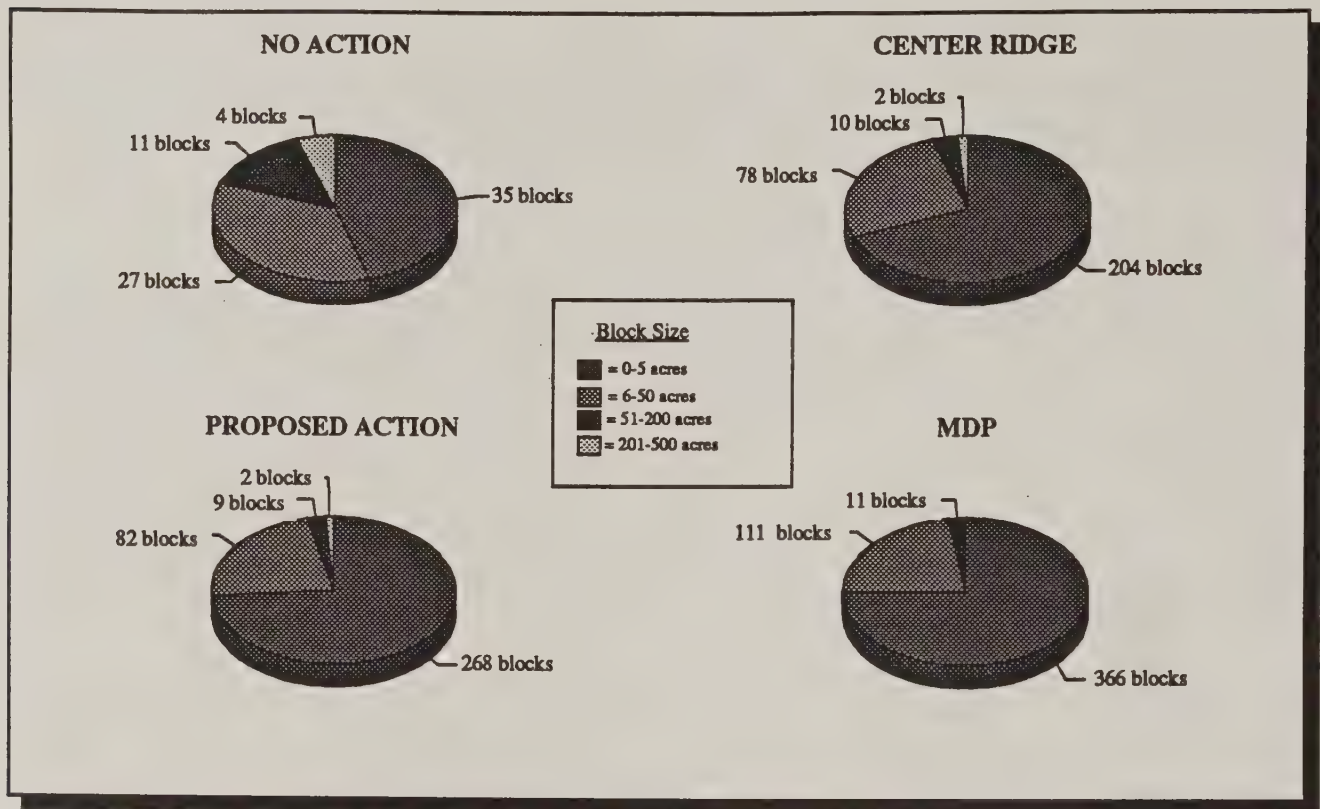


Figure 4.19. Number of blocks in each of four forest block-size classes in the PA by alternative.

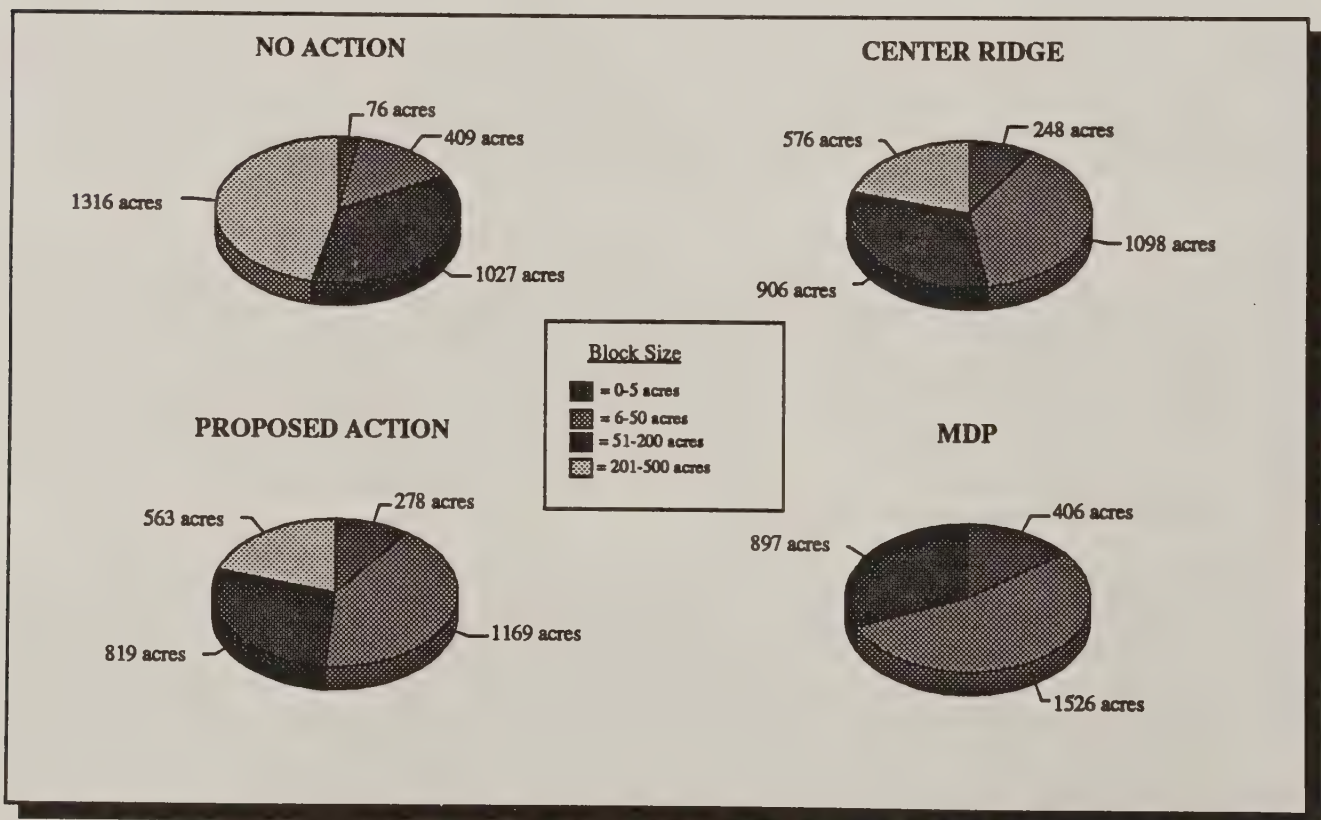


Figure 4.20. Acres in each of four forest block-size classes in the PA by alternative

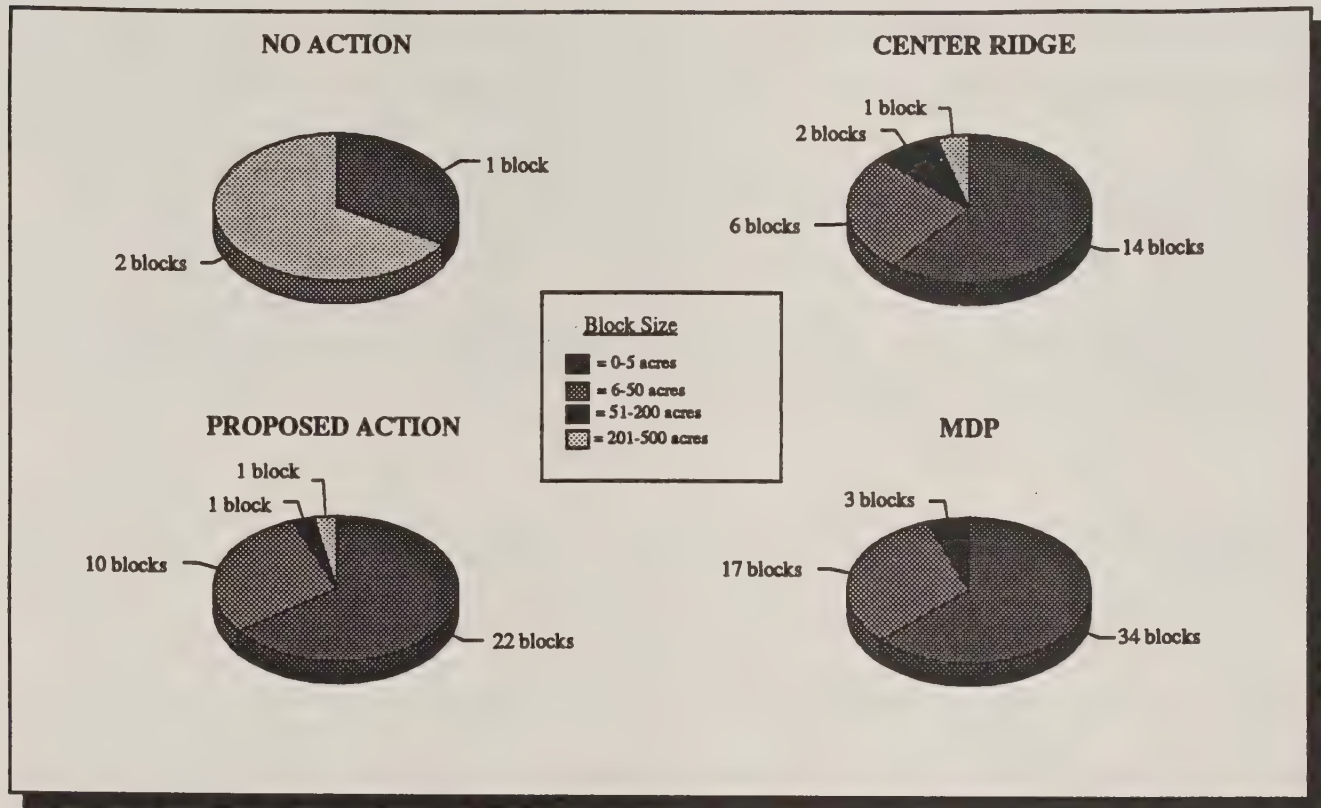


Figure 4.21. Number of blocks of four spruce-fir old-growth forest block-sizes in the PA by alternative.

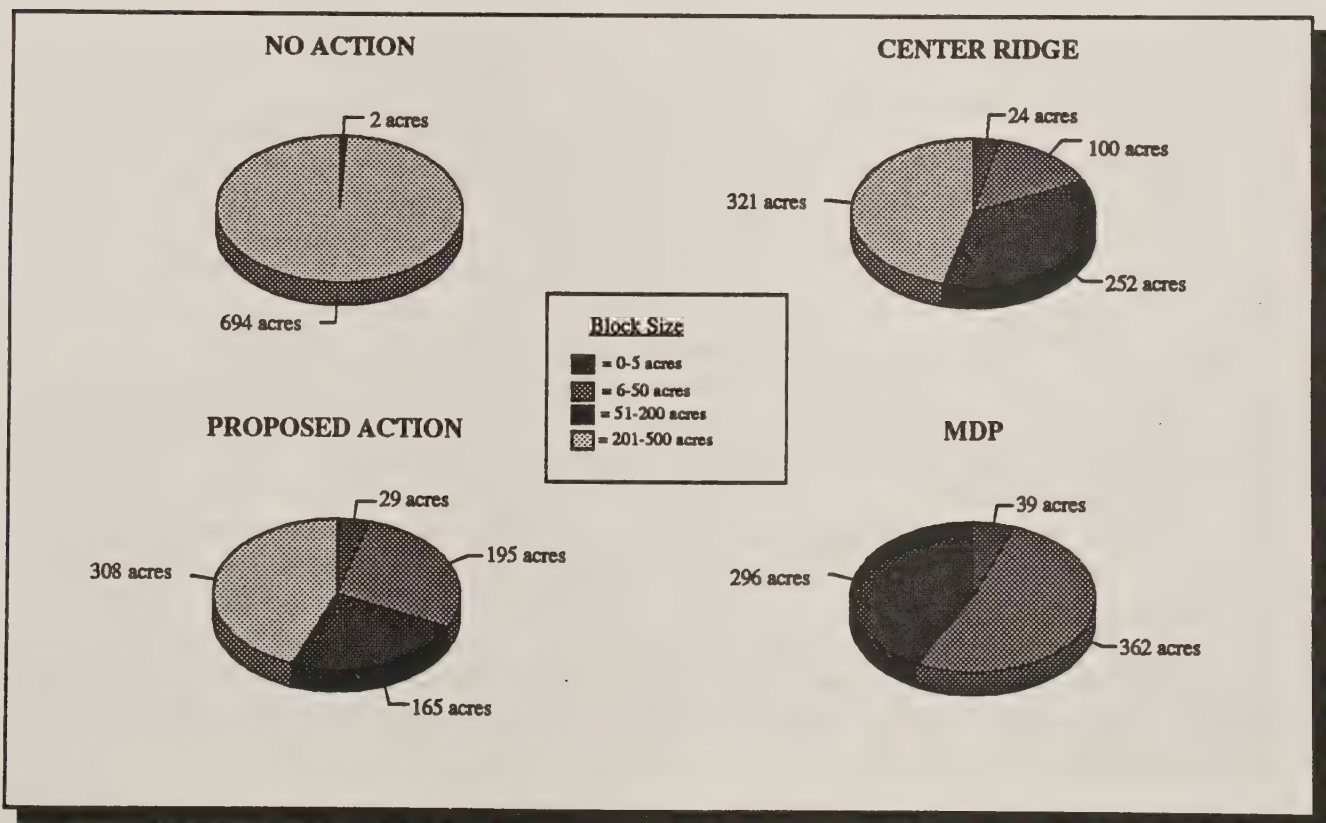


Figure 4.22. Total acres of four spruce-fir old-growth forest block-size classes in the PA by alternative.

4.3.5.1.4.2 *Ridge Lift Pod*

Effects on biodiversity resulting from implementation of this pod would be identical to those incurred from the development of Ridge Lift Pod described in the Center Ridge Alternative.

4.3.5.1.4.3 *Super Bowl Pod*

Effects on biodiversity resulting from implementation of this pod would be identical to those incurred from the development of Super Bowl Pod described in the Center Ridge Alternative.

4.3.5.1.4.4 *Tea Cup Pod*

Effects on biodiversity resulting from implementation of this pod would be identical to those incurred from the development of Tea Cup Pod described in the Center Ridge Alternative.

4.3.5.1.5 Alternative D - MDP Alternative

Implementation of Alternative D would effect biodiversity more than any other alternative. Changes in biodiversity at the species and community or habitat levels would be anticipated through the increase and maintenance of open, non-forested habitat types within the PA, and the corresponding decrease in contiguous, closed-canopy forest blocks that currently exist. About 471 acres of forested habitats would be converted to grassland/meadow habitat through the construction of conventional ski trails, lifts, and roads (MAP 13). This would increase the proportion of non-forested habitat in the PA from 25 to 36 percent, thereby increasing the amount of edge-habitat and forest fragmentation. Also, approximately 486 acres of forested land would be gladed, further reducing the quantity of interior-forest habitat, but to a lesser degree than in forested areas converted to conventional ski trails.

The overall effects of the habitat manipulations associated with this alternative would be an increase in the patchiness of habitat types due to fragmentation and a reduction in the area of contiguous forest stands. These changes would, in turn, affect the relative abundance of species by decreasing the number of individuals, and possibly species, associated with old-growth and interior-forest habitats and increasing those associated with edge habitats. Implementation of the MDP Alternative would eliminate all 201 to 500-acre blocks of forested land, and substantially increase the number of 0 to 5 and 6 to 50-acre blocks of land (Figure 4.19). As a result, these small acreage blocks would account for 68 percent of the forested acres within the PA (Figure 4.20).

Differences in this alternative compared to the Proposed Action include the development of ski trails and skiways/roads in Commando, West Super, and Lower Sun Down Bowls. There would also be several lift and facility changes associated with this alternative (See Chapter 2, Alternatives Considered in Detail). The overall effect to biodiversity would be increased fragmentation of habitats at the east and west ends of the PA. In particular, both 201 to 500-acre blocks of old-growth spruce-fir stands (694 acres total) would be fragmented, resulting in the creation of 33, 17, and 3 blocks of 0 to 5, 6-50, and 51 to 200-acre old-growth blocks, respectively (Figures 4.21 and 4.22). Of most importance are the developments in Commando Bowl. These trails and skiways would significantly increase fragmentation of the largest block of old-growth forest in the PA. This would adversely affect a large portion of potential denning habitat and feeding habitat for lynx, along with habitat for many other old-growth and interior-forest dependent species. Furthermore, like Alternative C, this alternative would develop trails through the portion of this old-growth stand that crosses over into East Pete's Bowl, thereby

decreasing the availability of interior-forest habitat in that area. Also affected would be the unique forested wetland habitats found in East Pete's and Commando Bowls.

Another impact associated with this alternative would be construction of a temporary logging road linking the Commando Saddle area in the PA, with the existing Lime Creek road system. This 1.1-mile section of road would run through one of the largest blocks of recruitment spruce-fir stands in the LA. Thus, habitat for forest-interior and snag-dependent species would be adversely affected. Of particular concern is the loss of denning habitat for lynx and marten, and nesting habitat for boreal owls and three-toed woodpeckers if such a road were constructed. Also disturbance to some wildlife (i.e., elk) along this alignment would result from logging activities during the road's three- to five-year use, and from recreationists that would have access to the PA via this road.

4.3.5.1.5.1 *Commando Pod*

Implementation of this pod would have the most significant impact on biodiversity of any other pod regardless of alternative. Effects to biodiversity through the construction of this pod would be similar to those described in the Pete's Bowl Pod for the Proposed Action. However, some important differences associated with this pod would result from the construction of a Commando Lift and the increase in number of ski trails from 19 in the Proposed Action to 33 under this alternative. Development of this pod would convert 79 acres of old-growth spruce-fir, 45 acres of mature spruce-fir, 41 acres of mixed spruce-fir/lodgepole, 51 acres of lodgepole pine, 11 acres of aspen/conifer, 35 acres of spruce-fir savannah, and 5 acres of mixed savannah to conventional ski trails and associated roads and facilities. This would increase open, non-forested areas in the PA by 25 percent. Additionally, gladed trails through forested stands would convert 240 acres to savannah types, increasing the amount of this type in the PA by 59 percent.

Substantial reductions in average block size of old-growth spruce-fir, mature spruce-fir, lodgepole, and mixed spruce-fir/lodgepole habitats would occur. These changes, in combination with the conversion of forested types to open and savannah types, would increase the amount of edge and decrease the amount of forest-interior habitat. Construction of the trails and other developments in this pod would result in no inter-trail forested blocks greater than about 300 feet wide. Thus, habitat suitability for interior and old-growth dependent species would decrease, while habitat for edge-tolerant species would increase.

The most tangible effects of fragmentation due to development of this pod would be those related to the reduction of interior and old-growth forested habitat in East Pete's and Commando Bowls. Of particular concern is the large block of old-growth spruce-fir forest in these bowls. Currently, this block represents the largest continuous stand of old-growth forest in the PA. Within this block is suitable denning and feeding habitat for lynx, marten, and black bear, and evidence of use by these species has been documented in this area. Nesting habitat for old-growth sensitive birds (e.g., red-breasted nuthatch, three-toed woodpecker, brown creeper) would also be reduced. Unique, and sensitive habitat types, such as special aquatic sites and rock cliffs, also occur in this area and further increase the value of this stand from a biodiversity perspective. Fragmentation of this area with ski trails, roads, and a lift would reduce its value to the species mentioned above as well as other old-growth species. It would also risk disturbance of the unique habitats within the block and the organisms associated with them.

4.3.5.1.5.2 *Super Bowl Long Pod*

Development of this pod would convert 13 acres of old-growth spruce-fir, 46 acres of mature spruce-fir, 5 acres of mixed spruce-fir/lodgepole, 25 acres of lodgepole pine, 3 acres of aspen, 10 acres of aspen/conifer, 2 acres of spruce-fir savannah, 13 acres of mixed savannah, and 61 acres of lodgepole savannah to conventional ski trails

and associated roads and facilities. This would increase open, non-forested areas in the PA by 16 percent. Additionally, gladed trails through forested stands would convert 139 acres to savannah types, increasing these types by 34 percent.

The majority of fragmentation associated with this pod would occur in lodgepole pine habitat. The conversion of a 201 to 500-acre stand of mature lodgepole pine into more than thirty 6 to 50-acre blocks, would increase the amount of edge and decrease the amount of interior-forest habitat. These changes, in combination with the reduction of a 201 to 500-acre old-growth spruce-fir stand and a 51 to 200-acre aspen/conifer stand into several smaller blocks, would occur due to the construction of conventional and gladed trails, and the West Super Skiway. Thus, habitat suitability for interior and old-growth dependent species would decrease, while that for edge-tolerant species would increase, potentially causing a change in species composition.

The effects of reduced block size and increased fragmentation would alter the ratio of forest-interior to edge habitats to the extent that virtually no forest stands would have a width greater than about 300 feet. As a result, there would likely be a decrease in the number of individuals, and possibly species, of organisms associated with forest-interior conditions and a corresponding increase in populations of edge-tolerant species.

4.3.5.1.5.3 *Super Bowl West Pod*

Development of this pod would convert 29 acres of mixed spruce-fir/lodgepole, and 41 acres of lodgepole pine to conventional ski trails and associated developments. This conversion would increase open, non-forested areas by approximately 7 percent. Additionally, gladed trails through forested stands would convert 88 acres to savannah types, increasing this type by 21 percent.

The number and density of ski trails proposed for this pod is considerably lower than those proposed for either the Commando and Super Bowl Long Pods. Consequently, habitat fragmentation resulting from implementation of the Super Bowl West pod should have fewer implications for biodiversity. This pod would fragment a large contiguous block of spruce-fir, mixed spruce-fir/lodgepole, lodgepole, and aspen/conifer forest into 11 blocks with an average size of less than 51 acres. Three blocks would retain widths greater than 300 feet. Thus, even though some forest-interior habitats would be lost and edge habitats created, some interior forest may remain. Consequently, while the population viability of smaller forest-interior species such as the southern red-backed vole would not likely be affected by development of this pod, that of organisms requiring larger contiguous tracts of forest, such as nesting northern goshawks, probably would be. If so, this conversion may result in some change to the species composition of this pod. Also, because Super Bowl West has been identified as the only potential goshawk nesting area in the PA, its development may prevent goshawk from nesting in this area in the future.

4.3.5.1.5.4 *Lower Sun Down Pod*

The trails, lift, terminals, skiways, and roads associated with this pod would be constructed in the northwest corner of the PA. Currently, this area has a high degree of patchiness resulting both from the existing developments associated with Lift 5 and from naturally occurring small blocks of aspen, aspen/conifer, and lodgepole forests, and mountain brush and grassland/meadow habitats. A creek bisects this area and a series of beaver ponds are also present. Given this pre-existing habitat patchiness, developments would have little influence on the ratio of habitat types or the average size of blocks. Thus, little change should be observed in species abundance or richness in this area.

4.3.5.1.5.5 *Tea Cup Pod*

Effects on biodiversity resulting from implementation of this pod would be identical to those incurred from the development of Tea Cup Pod described in the Center Ridge Alternative.

4.3.5.2 **Potential Mitigation Measures**

Potential mitigation measures for impacts to biodiversity include: 1) limiting or reducing the number of conventional ski trails, 2) preserving large blocks of habitat, 3) utilizing slash generated by timber harvest to enhance wildlife habitat, and 4) controlling human disturbance to critical habitat during specific wildlife windows. A discussion of these and other standard mitigation measures and potential mitigation measures that are project-specific for each resource are discussed in Chapter 2. Table 2.11 summarizes the major measures noting their effectiveness and the organizations responsible for authorizing and implementing them.

4.3.5.3 **Unavoidable Adverse Impacts**

The fragmentation of and reduction in average block size of forested habitats would occur through implementation of any of the action alternatives. Under the Center Ridge Alternative, these effects would be primarily limited to lodgepole pine stands and, to a lesser extent, old-growth stands of spruce-fir. However, the Proposed Action and the MDP Alternative would result in substantially more forest fragmentation, especially in old-growth stands of spruce-fir. Under implementation of the MDP Alternative, the overall result of this fragmentation is likely to be a loss of species diversity in the PA as forest-interior species are extirpated from diminishing forest blocks. This could also occur under implementation of the Proposed Action, but to a lesser degree.

4.3.5.4 **Cumulative Effects**

Development of each pod would tend to convert forested to non-forested habitat, increase the percentage of the ski area in a state of maintained grassland, fragment existing forest, reduce forest block size, increase edge habitat, and remove forest habitat linkages. It is important to remember that measurements of biodiversity are scale-dependent. In fragmenting large, relatively homogeneous forest blocks, the variety of community types occurring along an environmental gradient may increase dramatically. Thus, while such an increase might, depending on the alternative, be dramatic at the scale of the PA, it would be much less so on the LA scale. The critical thresholds at which such local, stand effects begin to substantially influence biological diversity on LA or RA scales are largely unknown. However, it is likely that the No Action and Center Ridge Alternatives would have little to no effect on biodiversity on the LA and RA scales. The possibility that biodiversity would be affected from implementation of the Proposed Action or the MDP Alternative is more likely.

Natural occurrences such as avalanche and severe fire events will continue to affect biodiversity at all three scales. As previously discussed in Chapter 3, Vegetation, the history of the Vail area indicates that wildfire has been an important cause of natural disturbance in this ecosystem. The fire that occurred on Battle Mountain in the late 1800's left the large naturally open areas in portions of Super and Pete's bowls that have been identified as prime ski terrain under this proposal. Natural events influence the environment and contribute cumulatively to the impacts caused by human disturbance.

The PA is one of the few portions of the LA that has had relatively few human-caused habitat alterations during the last 100 years. It was this lack of human alteration that originally qualified the area to be identified as a

portion of the larger "Two Elk Roadless Area" in the Forest Service's RARE II analysis of 1977. The Final Environmental Statement for RARE II (USDA-FS 1979) placed the Two Elk Roadless Area in a non-wilderness, multiple use class. This classification was carried through in the WRNF Plan which designated various portions of the area for downhill skiing, semi-primitive motorized and non-motorized recreation, livestock grazing, and timber production (USDA-FS 1984). The results of this designation, along with previously existing trends in commercial development, have manifested in a situation where the existing ski area to the north, timber harvest and associated roads to the south, and urban developments and highways to the north, east, and west, have substantially fragmented the Two Elk ecosystem. This fragmentation may have already been responsible for the decreasing population sizes of wildlife species which require relatively large undeveloped areas to remain viable (e.g., lynx, wolverine, goshawk).

These factors, along with the comparatively small size of the CAT III area, render the suitability of CAT III to function as a core reserve quite low. More likely is its potential to function as a movement corridor or, more appropriately, a "stepping stone" enabling wildlife to move between areas which probably do function as core reserves, the Holy Cross and Eagles Nest wildernesses. Assuming a given species is able to cross the Eagle River, Highway 24, and the railroad tracks to the west, and I-70 to the east, the CAT III area could function in this capacity for that species. However, other than a limited amount of information on elk use and movement through the area, there is little or no data to substantiate whether, and for which species, the PA serves this function. If, in fact, the PA does act as a wildlife movement corridor, implementation of the Proposed Action or one of its alternatives could adversely affect its functioning as such. Depending on the alternative, however, this impact would probably be short-term and last only as long as construction activities in the CAT III area. For example, following the completion of construction associated with the Center Ridge Alternative, there would be little activity in the PA during spring and fall, the major periods in which wildlife species are likely to be moving through the area. Consequently, implementation of this alternative would be unlikely to significantly impair its function as a corridor for the simple reason that if a given animal is able to make it past the natural and human-made barriers on either side of the PA, the relatively minor developments within it would probably not restrict the animal's further movement. In contrast, under the Master Development Plan and, to a lesser extent, the Proposed Action, animal movement is likely to be more restricted.

Development occurring outside of the PA may also restrict wildlife movements in this potential corridor. For example, a residential development in the Battle Mountain area near Red Cliff and Gilman has been discussed, but no plans or proposals for its construction are currently in place. This block of private land is located about one mile southwest of the PA and SUP boundary at its nearest point. This development would most likely fragment relatively large blocks of lodgepole pine, spruce-fir, and aspen stands. This would not only impact biodiversity in the LA, but also further narrow the potential wildlife movement corridor between the Holy Cross and Eagles Nest wildernesses. To the extent that such development reduces wildlife movement, it will also reduce gene flow between these areas and eventually lead to a loss of genetic diversity in affected wildlife populations. The potential effects of this development on big game populations have already been discussed (Chapter 4: Wildlife).

Current timber sales in Turkey Creek and a potential future sale in Timber Creek would increase forest fragmentation in the LA and RA. Timber harvest has occurred in portions of the Turkey Creek drainage, while more limited harvest has occurred in Timber Creek. Some of the oldest stands of forest in the LA are located in Timber Creek, and this area has suitable habitat for a number of sensitive and candidate wildlife species (i.e., lynx, goshawk, boreal owls, three-toed woodpeckers). The combination of a possible future sale in Timber Creek and implementation of either the Proposed Action or MDP Alternative has the potential to fragment and reduce the available interior-forest habitat in the LA, depending on final design of any possible timber sale. The

combination of possible timber sales (926 acres), together with potential ski area impacts (as much as 177 acres) could result in an impact to roughly 21 percent of the spruce-fir old growth and recruitment stands in the LA. This extent of impact is a very conservative estimate due to the fact that much of the timber sale acreage includes re-entry into previously treated stands and harvest in areas which are neither spruce-fir nor old growth. Regardless, using this estimate, total old growth and recruitment composition in the LA would change from 14.8 percent currently, to 12.1 percent under the MDP Alternative.

Potential development of a reservoir (Iron Mountain) near the Town of Red Cliff could inundate a substantial acreage of wetlands and riparian habitat. Areas nearby are used by the Homestake elk herd and other herds as winter range. If developed, this reservoir could limit access or use of elk winter range. Numerous other species would be affected by this proposed development, possibly resulting in a loss of biodiversity. More importantly, though, implementation of this reservoir project, in conjunction with the potential residential development in the Battle Mountain area near Red Cliff and Gilman, timber sales, and the development of Vail Ski Area into the CAT III area, would seriously limit the potential of the PA and LA to act as a wildlife movement corridor between the Holy Cross and Eagles Nest wildernesses.

Additional fragmentation to old-growth spruce-fir stands could occur from development of new ski trails or improvements of existing ski trails in the CAT I and II areas. Several ski trails have been approved for development in the CAT I area and they could fragment portions of the remaining interior forest stands on the front side of Vail Mountain. Even though not all these areas may be developed, in total, they could fragment much of the old-growth or recruitment old-growth remaining in this area.

4.4 HUMAN ENVIRONMENT

4.4.1 CULTURAL RESOURCES

4.4.1.1 Direct and Indirect Impacts

None of the alternatives will affect significant cultural resources. In 1995, the Colorado State Historic Preservation Officer, James E. Hartmann, concurred with the "no effect" determination, but stipulated that further testing of site 5EA710 would be necessary prior to any development in the vicinity of the site. He recognized that the Proposed Action would not involve any activities in that area. Evidence from current and previous investigations indicate that prehistoric use of the PA was limited. Useful resources found here include flora and fauna and knapping stones of marginal quality. The lack of resources combined with the strong cold air drainage of Two Elk Creek probably restricted use of the area to summer months only (Shields 1993). Therefore, given these evaluations and approvals it is concluded that there would be no impacts to cultural resources under any of the CAT III area action alternatives.

4.4.1.2 Potential Mitigation Measures

A discussion of standard mitigation measures and potential mitigation measures that are project-specific for each resource are discussed in Chapter 2. Table 2.11 summarizes the major measures noting their effectiveness and the organizations responsible for authorizing and implementing them.

No mitigation is recommended; however, should cultural resources be discovered during construction, all activities at the site would immediately cease, so that appropriate measures could be taken to protect and evaluate the site.

4.4.1.3 Unavoidable Adverse Impacts None

4.4.1.4 Cumulative Impacts None

4.4.2 LAND USE

4.4.2.1 Ski Area Special Use Permit

All action alternatives involve acceptance of an amended Master Development Plan for the CAT III area, a document required by the SUP. Forest Service policy requires that only lands which are necessary for facilities and public health and safety remain under the SUP. None of the alternatives in this EIS develop all lands within the CAT III area and consequently offer the possibility to reduce the extent of the SUP boundary. These areas are noted in Table 4.9. Avalanche control measures are not allowed outside of the permit area.

If a decision is made to modify the SUP boundary, it will be noted specifically in the ROD. Such a modification could also occur after the ROD is issued, following more detailed review of operational and safety considerations.

Table 4.9. Possible SUP Boundary Amendments

Alternative	General Area
A - No Action	The entire CAT III area.
B - Center Ridge	Super Bowl West and Lower Sun Down, Commando, East Pete's, and eastern Pete's bowls.
C - Proposed Action	Super Bowl West and Lower Sun Down, and Commando bowls.
D - MDP	Various small areas scattered around the periphery of the SUP boundary.

4.4.2.2 Other Special Uses

During scoping, several issues arose regarding how the CAT III area development might affect outfitter/guide operations around the CAT III area. None of the alternatives considered would change these permitted activities. Current Forest Service policy limits the issuance of new outfitter/guide SUPs. Indirect effects that might relate to outfitter/guide operations are discussed in the various resource sections of this chapter.

4.4.2.3 Roadless and Undeveloped Areas

As noted elsewhere in this EIS, Forest Service management for the CAT III area is guided by the Forest Plan, which stipulates that the area be managed for downhill skiing opportunities. No special status or protection is afforded roadless and undeveloped areas. Regardless, this EIS evaluates the attributes, or values, of roadless and

undeveloped areas which were identified during public scoping. The general effect on these values is described below.

4.4.2.3.1 Impacts Common to All Action Alternatives

Wilderness

In Chapter 3, the status of the CAT III area relative to wilderness designation was discussed. In summary, the area was previously considered for designation but released for other multiple uses, such as ski area development. The Forest Plan continues to provide the management direction for the CAT III area. All action alternatives would substantially alter the undeveloped character of the CAT III area. Ski lifts, trails, roads, and skiways are facilities inconsistent with what most would consider a roadless area. In so doing, all alternatives would likely continue to render the CAT III area and lands adjacent to it unsuitable for wilderness designation.

Recreation

All action alternatives would change the focus and location of recreational activities in the CAT III area. Rather than exclusively offering opportunities for backcountry, non-motorized types of recreation, developed portions of the CAT III area would be managed for intensive skiing. In the summer, trails in the CAT III area currently offer opportunities for hiking, mountain biking, camping, and hunting, in a setting that is relatively undeveloped. Through the construction of ski facilities under all of the action alternatives, substantial portions of the CAT III area would remain open for the same activities, but the experience would take place in a much more developed environment. A substantial portion of the development would take place in areas which are already open and would require no tree clearing, yet lifts and other structures may be visible.

Biodiversity

Public scoping identified a number of concerns which are addressed in this EIS under the heading of Biodiversity. One issue which was identified during scoping was whether the CAT III area represents a relatively uncommon, high elevation, forested ecosystem which should be protected. The Holy Cross Ranger District is about 340,000 acres in size and approximately 70 percent is forested with about 32 percent (108,000 acres) in spruce-fir type forest. While a small portion might be subject to timber management activities in the future, designated wilderness is an area in which timber harvest is precluded. Of the 117,000 acres designated as Wilderness on the Holy Cross Ranger District, approximately 54 percent (63,000 acres) is forested. The spruce-fir component of these forested areas represents about 35 percent of the total Wilderness acreage, and is in fact 12 percent of the total Ranger District. Preliminary data for the entire White River National Forest Plan revision indicates a similar composition. Consequently, it would seem that high elevation, spruce-fir forests of the type found in the CAT III area are not uncommon.

One of the more frequent comments expressed during scoping related to the ecologic value of roadless and undeveloped areas. In particular, many felt that large, unfragmented old-growth forest areas; habitat for threatened, endangered, or Forest Sensitive species; and wildlife corridors were all important functions or values associated with the CAT III area. These are summarized below, but discussed in more detail in the Wildlife and Biodiversity sections of this chapter.

The corridor facet of this discussion is particularly complex. During scoping, some members of the public expressed the opinion that the CAT III area constitutes a large portion of a critical biological corridor linking the Holy Cross and Eagles Nest wildernesses. It should be noted that there is no documentation of a particular species for which this area provides a critical link. The presence of a four-lane interstate highway on the northeastern periphery and State Highway 24, a railroad line, and a canyon on the western boundary, creates a

serious impediment to the function of the corridor, even though there are several "bridges" which provide movement corridors between these areas. The primary species affected by these facilities or features include elk, deer, and many medium and large mammals.

In even closer proximity to the undeveloped core area, timber harvest, Forest Service roads and jeep trails, ski area developments, and intensive recreation are all present. In total, this tends to define the contiguous, undeveloped lands surrounding and including the CAT III area as an "island," rather than "corridor." Again, however, this would not necessarily negate the value of the area to serve as movement corridor for some species of wildlife or prevent some opportunity for exchange of genetic information. Many species are relatively tolerant to the presence of human facilities, such as roads, but are intolerant of actual human presence. Development of ski facilities in the CAT III area has the potential to create some additional adverse impacts to these corridor functions, even though a serious question remains whether a truly functional corridor exists. If it is functional, determining the degree to which ski trails and other ski facilities would limit movement or create a barrier for wildlife that have been successful in negotiating the surrounding obstacles, is difficult. Inversely, those species which depend on grassland-to-grassland migration or movement would benefit from increased timber clearing in this area.

The wilderness-to-wilderness corridor concept aside, the degree of fragmentation within the PA for each alternative best addresses the general concern for wildlife movement. Primarily through construction of ski trails, each of the action alternatives fragment forested habitat to varying degrees. Finally, the retention of old-growth forested habitat is an important indicator of the relative impact of each of the alternatives on ecosystem. This impact is summarized below for each alternative, but is discussed in the Biodiversity section of this document in detail.

4.4.2.3.1.1 Alternative A - No Action

Under this alternative, the roadless character of the CAT III area would be retained. However, timber management activities and motorized recreation would continue in areas surrounding the CAT III area. While the CAT III area would continue to offer about 3,460 acres of land with backcountry, non-motorized recreation opportunities, nearby lands would be managed for a variety of purposes and uses, many of which are roaded.

Under this alternative about 697 acres of old-growth forest in the PA, and about 3,466 acres in the LA would remain as habitat for late successional and interior dependent wildlife species.

4.4.2.3.1.2 Alternative B - Center Ridge

The Center Ridge Alternative would create a zone of influence from ski trail development and other ski area facilities that would extend over an area approximately 1,000 acres in size. This would occur primarily in Super Bowl, the eastern portion of Pete's Bowl, and the Center Ridge area. Within this area, backcountry (semi-primitive, non-motorized) recreation opportunities would change to a more developed, motorized setting.

Under this alternative approximately 42 acres of old-growth forest comprising about 6 percent of this habitat in the PA, and about 1 percent in the LA, would be cleared for ski trails and other facilities. In addition, about 54 acres (4 percent) of the PA would be converted from forested vegetation to permanent non-forested communities. Finally, two of the remaining four large blocks of forested habitat within the PA would be fragmented by development.

4.4.2.3.1.3 *Alternative C - Proposed Action*

The Proposed Action would create a zone of influence from ski trail development and other ski area facilities that would extend over an area approximately 2,200 acres in size. This would occur primarily in Super Bowl, Pete's Bowl, East Pete's Bowl, and the Center Ridge area. Within this area, backcountry (semi-primitive) recreation opportunities would change to a more developed setting.

Under this alternative, approximately 94 acres of old-growth forest comprising about 13 percent of this habitat in the PA, and about 3 percent in the LA, would be cleared for ski trails and other facilities. In addition, about 354 acres (7 percent) of the PA would be converted from forested vegetation to permanent non-forested communities. Finally, two of the remaining four large blocks of forested habitat within the PA would be fragmented by development.

4.4.2.3.1.4 *Alternative D - MDP Alternative*

The MDP Alternative would create a zone of influence from ski trail development and other ski area facilities that would extend over most of the entire CAT III area which is currently removed from the effects of roads and other developments. Some small areas along the periphery of the CAT III area may remain sufficiently isolated to preserve what some would consider a backcountry experience.

Under this alternative, approximately 177 acres of old-growth forest comprising about 25 percent of this habitat in the PA, and about 5 percent in the LA, would be cleared for ski trails and other facilities. In addition, about 354 acres (7 percent) of the PA would be converted from forested vegetation to permanent non-forested communities. Additionally, all of the remaining four large blocks of forested habitat within the PA would be fragmented by development.

4.4.2.4 *Grazing*

Under the No Action Alternative, domestic sheep would continue to graze in the CAT III area under the terms of a grazing permit with the Forest Service. All action alternatives include the potential for some adverse impacts to occur to revegetation efforts as a result of grazing. Large numbers of sheep could trample new vegetation and sheep could consume mulch intended to speed the establishment of a protective vegetative cover. Consequently, the Forest Service may require the permittee to modify grazing patterns, areas of use, or even temporarily close certain areas to grazing completely.

4.4.2.5 *Mineral Development*

On March 5, 1995, the CAT III area was withdrawn from mineral location and entry by the BLM for a 15-year period. This action precludes mineral exploration and development opportunities normally available on National Forest System lands under provisions of the General Mining Laws. Consequently, none of the action alternatives would affect mineral development activities. Under the No Action Alternative, mineral activities could be considered in the future if the withdrawal was revoked.

4.4.2.6 Wilderness

The Holy Cross and Eagles Nest wildernesses are located 5 and 3 miles from the CAT III area, respectively. None of the alternatives would affect the wilderness resource, although from several view points portions of the CAT III area could be visible from a distance of 5 to over 10 miles away.

4.4.2.7 Private Land Uses

All elements of the alternatives are located on National Forest System lands. Consequently, no private land uses would be directly affected. With no increase in approved ski area capacity, off-site development as a result of construction of lodging and other service facilities should be negligible. Additional employees associated with operation of the CAT III area facilities under each of the alternatives is anticipated. As noted below, the socioeconomic impact of each of the alternatives would be dispersed over a wide geographic area composing the commuting range to Vail. In a similar manner, private land use changes as a result of additional employees would be diluted over the same area and, considering the relatively small number of permanent employees involved, would be inconsequential to any one community or county.

4.4.2.8 Cumulative Effects

Implementation of any action alternatives would be part of a broader pattern of development of land in Vail Valley and Eagle County for residential and commercial purposes, roads, and parking lots. These will continue into the future and are part of a surge many Colorado mountain communities are facing. Ski areas, such as Vail, Beaver Creek, Arrowhead, and a potential resort at the Adam's Rib Recreation Area, are a part of this complex trend and contribute to these changes in land use, each in their own way. Summer recreation programs at Vail Ski Area and an assortment of activities originating out of the TOV and other communities in the Vail Valley are part of a broader increase in summer recreational use of public lands.

The combined effects of existing ski area facilities in the Back Bowls, together with the CAT III area developments would tend to change the land use pattern in the PA. However, no off-site facilities are contemplated in association with the development. Though a small number of additional employees would be required to operate the CAT III area ski facilities, their impact on the land use pattern over the larger Vail Valley and beyond would be imperceptible.

4.4.3 RECREATION AND ALPINE SKIING

This section is divided into two main parts. Immediately following this introduction is a discussion of the potential impacts to general recreation as a result of implementing the Proposed Action and alternatives to it. This section concludes with a discussion of alpine skiing as it relates to each of the alternatives.

4.4.3.1 Direct and Indirect Effect on General Recreation

Activities discussed in this section include cross country skiing, hiking, mountain biking, hunting, and other dispersed forms of recreation. No public motorized travel is anticipated in the CAT III area under any alternative. The potential impacts to general recreation opportunities in the area are very much related to changes in recreation experiences. Often experiences are closed associated with the visual character of the area where the recreation takes place. The reader is directed to Section 4.4.7 for a complete discussion of impacts to visual resources.

4.4.3.1.1 Impacts Common to all Action Alternatives

All action alternatives involve the construction and operation of alpine skiing facilities, such as lifts, roads, and bridges in an area which is currently used for dispersed, backcountry types of recreation. While the development of these facilities is consistent with Forest Plan direction for this area, any of the action alternatives would represent a substantial change to recreational experiences available in the area. As noted in Chapter 3, though no formal ROS category is assigned to lands within ski area SUP boundaries, the CAT III area would most closely fit a semi-primitive, non-motorized classification. For convenience, this classification is referred to as backcountry below. In this regard, the term "non-motorized" is somewhat of a misnomer, since none of the CAT III would be open to motorized public use under any alternative. With development, substantial portions of the area would no longer qualify as a "backcountry" setting, though there would be little change in the type of activities that are currently available. The acreage of backcountry recreation opportunities that would remain after implementation of each of the alternatives is indicated below. It is an approximation based on developments occurring in various sub-watersheds and the acreage of each.

During construction, disruption to recreational use of the area would be most pronounced, as vehicle traffic and noise would be common. Yet over the long term, all of the same summer recreation pursuits would still be available in the area. Backcountry skiing would be reduced by varying amounts under all action alternatives, although except on the eastern periphery, this is not an especially popular activity. Also, the closure of China Bowl would continue each spring during elk calving season under all alternatives.

The CAT III area would remain open to big and small game hunting under all alternatives. However it is likely that, due to construction and other activities, the area may not be as attractive for big game hunting, especially in the short term.

Much of the summer use in the area occurs on the Two Elk Trail. Substantial ski area facilities would be constructed along this trail, from just above the base of Lift 21 to the confluence of Tea Cup Bowl and Two Elk Creek. The trail user would be very much aware of the presence of lift terminals, bridges, and a skiway in this area. Some adjustments to recreational use may be required during certain phases of construction. None of these developments would be in conflict with the management direction for National Recreation Trails, of which the Two Elk Trail is a part.

None of the alternatives would physically change the Commando Run Trail. All ski area developments are removed from this trail and, in most cases, are not visible from the Commando Trail. On the other hand, various portions of CAT III area developments could be seen from that portion of Commando Run Trail that extends to the top of Mongolia Bowl. From this vantage point, the trail user would be within the developed portion of the ski area.

Development of any of the action alternatives would improve potential hiking and mountain biking opportunities in the CAT III area. However, it is not the objective of either the Proposed Action or any of the alternatives to increase summer recreation use of the CAT III area, in order to minimize impacts to wildlife. Yet, it is reasonable to expect that there will be some increase in non-motorized use in the area without some active efforts to manage access.

Summer recreation use in the Vail Pass, Shrine Pass, and Turkey Creek areas will continue to grow under all alternatives, including No Action. A substantial portion of this is mountain bike use. Occasionally, mountain bikes have been reported in the CAT III area, though this is not a common occurrence. Natural terrain and

vegetation which separates the CAT III area from Lime Creek Road does not present a complete barrier to adventurous mountain bike enthusiasts. Consequently, without special efforts to manage use, some level of unwanted mountain bike entry into the CAT III area is reasonable to expect under all alternatives. Even under the No Action Alternative, a mountain bike route could become established in this area over time. However, this would be increasingly likely under any of the action alternatives, which bring development closer to Commando Saddle and the Commando Run Trail.

There should be no appreciable effect on outfitter-guide's operating in the general area under any of the alternatives. No new outfitter-guide SUPs would be issued, regardless of the alternative.

4.4.3.1.2 Alternative A - No Action

The No Action Alternative would involve continuation of the current pattern of summer and winter uses in and around the CAT III area. Summer mountain biking and hiking would remain popular and use would likely increase as general recreation use in the broader area increases over time. Approximately 3,460 acres of the PA would continue to meet a semi-primitive, non-motorized ROS classification under this alternative.

4.4.3.1.3 Alternative B - Center Ridge

The Center Ridge Alternative would focus ski area development in the Super Bowl and Center Ridge areas, in addition to several bridges, two lift terminals, and a skiway along Two Elk Creek. Approximately 2,224 acres of the PA would continue to meet a semi-primitive, non-motorized ROS classification under this alternative. Primary construction activity and associated recreation impacts could last as long as 3 years.

4.4.3.1.4 Alternative C - Proposed Action

The Proposed Action would involve development in Super, Pete's, and East Pete's bowls, in addition to the Center Ridge area. Similar to Alternative B, a number of facilities would be constructed along Two Elk Creek that would be apparent to the trail user and perhaps affect their experience. In addition, an upper bridge and restaurant would be built under this alternative, also near the Two Elk Trail. Though not open in the summer season, the presence of the restaurant and other facilities may be objectionable to some trail users. Approximately 996 acres of the PA which are more removed from developments would continue to meet a semi-primitive, non-motorized ROS classification under this alternative. Primary construction in implementing this alternative and the associated recreation impacts could span as long as 5 years.

4.4.3.1.5 Alternative D - Master Development Plan

This alternative would involve some level of development throughout most of the CAT III area. Of particular importance would be development in Commando Bowl. While in close proximity, the Commando Run Trail itself would not be directly affected. From Two Elk Pass south, along the southeastern portion of the SUP area, this trail extends through relatively dense spruce-fir forest. This would screen most ski area developments that would be in place in Commando Bowl. However, some skiers using the Commando Run Trail occasionally detour and ski Commando Bowl itself, before rejoining the trail itself near Two Elk Pass. This opportunity may no longer be as attractive for backcountry skiers if developed alpine trails were in place. Finally, under the MDP Alternative the zone of ski area developments along the Two Elk Trail would be extended approximately one mile to both the east and west of the current base of Lift 21.

The MDP Alternative also includes construction of a temporary logging haul road from the existing Lime Creek Road to Commando Saddle. While various efforts (e.g., installing gates, formal closures, etc.) could be used to restrict public access on this road to minimize public use of the CAT III area, the nature of the surrounding terrain and vegetation would still allow entry for some. The presence of a road, even though closed, may prove to be an attraction for some recreationists, including mountain bikers, to travel cross-country to reach the CAT III area. Most larger areas of land within the CAT III area would be developed to some degree and very little, if any, of the PA would offer a backcountry (i.e., semi-primitive, non-motorized) recreation experience. In implementing this alternative, primary construction could last as long as 7 years.

4.4.3.2 Potential Mitigation Measures

A discussion of standard mitigation measures and potential mitigation measures that are project specific for each resource are discussed in Chapter 2. Table 2.11 summarizes the major measures noting their effectiveness and the organizations responsible for authorizing and implementing them.

- ◆ Develop and institute an information and education program to inform summer recreationists of construction activities.
- ◆ Restrict, or close portions of trails to public use, during periods of especially heavy construction.
- ◆ Institute a Forest Service closure for controlling public use of the area linking Lime Creek with the CAT III area.
- ◆ Upon completion of timber hauling, recontour the Lime Creek road connection and jack-straw timber and slash over the surface.

4.4.3.3 Unavoidable Adverse Impacts

Backcountry (i.e., semi-primitive, non-motorized ROS) recreation opportunities would change in the CAT III area. While summer recreationists would still be able to participate in the same activities they now do, the general setting would be more developed. Short-term alteration of summer recreation patterns may also be unavoidable during some construction periods.

4.4.3.4 Cumulative Effects

Past actions in the CAT III area and Back Bowls which may contribute in a cumulative fashion to recreation impacts include construction and use of the Sleepytime Road and Lift 21. Also, occasional high levels of use on the Commando Run and Two Elk Trails may detract from the experience for some who are seeking a setting with more solitude. Relatively intense summer recreation on the front side of the ski area is expected to continue in the future. On occasion, some individuals use the trails and lifts to gain access to the either the Two Elk or Commando Run Trails. This is also expected to continue. In winter, grooming and large numbers of downhill skiers in the CAT III area would dramatically change the atmosphere of the area.

Future actions or activities which may contribute cumulatively include the upgrade and realignment of Lift 22. As approved, the lift would extend from a new base facility along Two Elk Creek, near the base of Commando and East Pete's bowls, to the upper portion of Mongolia Bowl. The base terminal would be adjacent to the Two

Elk Trail, while the upper portion of the lift line and upper terminal would be readily apparent to those using Commando Run Trail as it ascends Mongolia Bowl.

Additional information regarding recently completed, ongoing, and foreseeable future projects that could affect this resource is found in the Cumulative Actions section of this chapter.

4.4.3.5 Alpine Skiing

4.4.3.5.1 Direct and Indirect Impacts

Since the proposal to develop the CAT III area was formulated expressly to improve alpine skiing at Vail Ski Area, most of the direct impacts of the Proposed Action fall in this realm, and most are positive. The physical and technical aspects of the Proposed Action and alternatives are detailed in Chapter 2. This section deals more with the functional impacts of these developments on alpine skiing.

Both positive and negative impacts are presented below to compare and contrast the Proposed Action and alternatives in terms of key considerations regarding alpine skiing. The process by which these considerations were identified and background information on each are presented in Chapter 3.

The discussion below focuses on the qualitative rather than the quantitative differences among alternatives. Yet it is reasonable to expect some difference in visitation over the long term. Represented in Table 4.10 are 10-year projections for skier visitation at Vail Ski Area based on potential compounded growth rates, ranging from 0.5 to 3.0 percent annually (Frick 1995). These projections are highly speculative but give an indication of the magnitude of change. Note that the Proposed Action results in higher maximum skier numbers than the MDP Alternative in this time frame. This results from the longer time frame for completion of the MDP Alternative.

Table 4.10. Projected skier visitation by alternative				
Ski Season	No Action	Center Ridge	Proposed Action	MDP
1994/95 (thousand)	1,568 - 1,568	1,568 - 1,568	1,568 - 1,568	1,568 - 1,568
2004/05 (thousand)	1,659 - 1,732	1,707 - 1,856	1,732 - 1,911	1,732 - 1,837
Change (%)	5.2 - 10.5	8.9 - 18.4	10.5 - 21.9	10.5 - 17.2

The qualitative and other quantitative differences among the alternatives are discussed in the sections which follow under the issue-based headings identified in Chapter 3.

4.4.3.5.1.1. Need for Development

The picture that emerges from the Chapter 3 discussion of need for the CAT III area development on the basis of supply and demand for skiing opportunities is that:

- ◆ the rate of growth in Colorado skier visits is variable and thus somewhat unpredictable;

- ◆ future growth is likely to be primarily in the form of destination skiers who are increasingly selective, choosing ski areas on the basis of quality and service, which will intensify competition among destination resorts to retain or increase market share;
- ◆ the supply of skiing opportunities in Colorado is likely less than most estimates indicate;
- ◆ the perception that there is a large surplus in capacity at Colorado's ski areas is misguided; and
- ◆ Vail Ski Area has lagged Colorado's average growth in skier visits since 1990, with this trend reversing in 1994/95.

In this scenario, CAT III area development might be justified on the basis of increased capacity alone if the 19,900 SAOT capacity threshold were not to remain in force. Conversely, the evidence of increased need for qualitative ski area improvements to retain or increase skier numbers and market share indicates need for the development. How the alternatives under consideration address this need is assessed below.

Alternative A - No Action

As highlighted below under Skiing Quality, then detailed under subsequent headings, the qualitative improvements comprised by this alternative would incrementally improve the skiing experience offered by Vail Ski Area, but the front side is largely built out and the potential for improvements is limited. Further, these developments would do little to increase the diversity of skiing alternatives or provide the attraction necessary to maintain or increase destination skier numbers. Thus, its overall impact in meeting the needs addressed by CAT III development would be limited.

Alternatives B, C and D - Center Ridge, Proposed Action and MDP

As clear from discussions under the preceding headings, the three CAT III development alternatives would all go a long way toward addressing the need for qualitative improvements to the ski area's desired experience for skiers. Increased glade and bowl skiing, more overall diversity and expanse in terrain, more reliable and consistent skiing, and a more appropriate terrain mix would be achieved under all three alternatives. These improvements would significantly impact the stated needs for CAT III area development in terms of supply and demand, particularly through their collective effect in helping attract destination skiers. This impact would increase from the Center Ridge Alternative through the MDP Alternative.

In terms of trail capacity, the increases associated with each capacity development alternative are specified in Table 4.11. In light of the 19,900 SAOT threshold, however, these capacities remain theoretical and of marginal utility in this analysis. They do indicate that Vail skiers would have enough terrain to preclude crowding even on peak days, especially when use of some areas, particularly the Back Bowls, is limited.

It should also be noted that, like any major ski area development, the CAT III area development would be monitored and phased according to performance in meeting the stated needs, supply and demand related or otherwise, as well as to market conditions and skier preferences.

4.4.3.5.1.2. Skiing Quality

Enhancing the quality of skiing opportunities at Vail Ski Area is a key aspect of the purpose of this proposal, as are making more efficient use of the on-mountain and local infrastructure and thereby helping stabilize seasonal fluctuations in the local economy. The Skiing Quality section in Chapter 3 outlines the overall importance of a

quality alpine skiing experience in attracting day and destination skiers to Vail. It further outlines current conditions in regard to bowl and glade skiing, effective utilization of the SUP area, and new development to freshen the ski area's skiing experience and thereby keep skiers who already ski Vail Ski Area interested and also attract new skiers to the area. The impacts of the Proposed Action and alternatives in these regards are outlined below.

Table 4.11. Projected trail capacity by terrain class.¹

	Beginner			Intermediate			Advanced			Total		
	Acres	% ²	Capacity	Acres	% ²	Capacity	Acres	% ²	Capacity	Acres	% ²	Capacity
Front Side	416	44	6,240	469	33	4,690	416	23	3,328	1,301	100	14,258
Back Bowls	36	2	180	951	43	3,329	1,726	55	4,315	2,713	100	7,824
Current Total	452	29	6,420	1,420	36	8,019	2,142	35	7,643	4,014	100	22,082
No Action	38	43	570	9	7	90	83	50	664	130	100	1,324
New Total	490	30	6,990	1,429	35	8,109	2,225	35	8,307	4,144	100	23,406
Center Ridge	38	8	152	265	51	927	242	40	726	545	100	1,805
New Total	528	28	7,142	1,694	36	9,036	2,467	36	9,033	4,689	100	25,211
Proposed Action	56	8	224	460	55	1,610	369	38	1,107	885	100	2,941
New Total	546	27	7,214	1,889	37	9,719	2,594	36	9,414	5,029	100	26,347
MDP Alternative	80	8	320	491	42	1,718	688	50	2,064	1,259	100	4,102
New Total	570	26	7,310	1,920	36	9,827	2,913	38	10,371	5,403	100	27,508

¹Trail capacity is a theoretical measure, since the 19,900 SAOT manage-to capacity actually limits visitation.

²Percentage of total capacity, not acreage, in this category.

Source: Vail Associates, unpublished 1995 data.

Alternative A - No Action

Some previously approved development would occur at the ski area under the No Action Alternative, mainly in the CAT I area (see Chapter 2). Key details are assessed below, but in summary these developments are intended to improve front side circulation, primarily through upgrading to higher capacity lifts. These developments have their own utility but would do little to address the quality-related objectives of the proposed CAT III area development. Specifically:

- ◆ No new bowl and only minimal gladed skiing terrain would be developed. Opportunities for such skiing would continue to be restricted to advanced skiers, primarily in the Back Bowls. Intermediate skiers would continue to rely on the front side's conventional trails.

- ◆ Little change in the overall diversity of the alpine skiing experience at Vail Ski Area would result, and this experience would be further limited when conditions precluded full use of the Back Bowls. Effective use of Vail's SUP area would be minimized.
- ◆ The unique skiing experience at Vail Ski Area would not be substantially updated in response to changing skier demands. Thus, this alternative would probably not constitute the change necessary to boost low-season visitation, as detailed below under Capacity Utilization.

The net impact of this development would probably not increase the ski area's attraction to destination skiers, and the ski area could lose ground to competitors upgrading with new developments. As a result, any growth in annual skier numbers would likely require increased day skiing. This would place Vail Ski Area squarely in competition with the many Front Range resorts vying to attract day skiers from the Colorado Springs-Fort Collins metropolitan corridor. In this intensely competitive market, promotions and decreased lift pass prices are required practices, so more skiers are needed to maintain a given revenue flow. Further, substantial growth in day-skier numbers generally translates to higher skier numbers on already high visitation days, since day-skier visits are highest on weekends and holidays.

While increasing annual visitation through the day-skier market might maintain or increase skier visitation on an annual basis and thereby help to at least maintain recreation opportunities for skiers visiting National Forest System lands as well as the ski area's viability, it could well diminish the quality of Vail Ski Area's desired skiing experience.

Alternatives B, C and D - Center Ridge, Proposed Action and MDP

Implementation of these alternatives would positively impact skiing quality, helping the ski area maintain its desired ski experience and market niche. By bringing new terrain under the resort's management, it would also increase the range of options available to VA to continue refining the ski area's offerings. Generally, these options would increase across alternatives, growing from B through D.

Development of areas in Super and Pete's bowls would add new bowl and gladed skiing to the ski area's terrain inventory. More development of Pete's Bowl and development in East Pete's under the Proposed Action, and adding Commando, more of East Pete's, more of Super, and West Super bowls under the MDP Alternative, would substantially increase the availability of this type of terrain. Much of the new terrain would be classified as intermediate, making this kind of skiing accessible to less advanced skiers. This is discussed further under Terrain Mix.

Any of the development alternatives would diversify the alpine skiing opportunities available at the ski area and make more effective use of the SUP area. As detailed below under Reliability of Skiing, snow and weather conditions in the CAT III area are typically better and more consistent than in the Back Bowls, so more diversity could be maintained when the Back Bowls were not being used. This diversity would help maintain the area's attraction to destination skiers seeking new experiences over longer periods.

Development of Super Bowl and part of Pete's Bowl might constitute the update to Vail Ski Area's desired skiing experience necessary to boost off-peak skier numbers and maintain or increase annual visitation. Adding more ski terrain from Pete's and East Pete's bowls would strengthen the draw, and further expansion into Commando, East Pete's, Super and West Super bowls would offer a whole new dimension. Any new CAT III area terrain could legitimately be considered a fundamental addition to Vail's alpine skiing opportunities, but the addition would grow from the Center Ridge Alternative through the MDP Alternative.

Any of these improvements might prove sufficient to sustain Vail Ski Area's overall performance in providing recreation on public lands and to allow it to maintain its current, general character in terms of skiing quality. The assurance that this would be the case probably increases from the Center Ridge Alternative through the MDP Alternative.

4.4.3.5.1.3 Ski Area Capacity

As indicated in the statements of purpose and need for this proposal (Chapter 1) and stated directly in Chapter 3, capacity in itself is not a major consideration in this proposal or this analysis. The 19,900 SAOT manage-to approach will remain in force regardless of the alternative implemented, so the skier capacity increases noted below would not translate to a higher limit on daily skier visits. Thus, no real change from previous capacity considerations is involved. However, more efficient, consistent, and uniform utilization of capacity are central aspects of the proposed development, particularly as they bear on use of off-mountain infrastructure and seasonal economic fluctuation. Both trail capacity and the more relevant capacity utilization are addressed below.

In this analysis, it is most useful to assess capacity changes in terms of the type of alpine skiing experience VA is attempting to maintain and further develop. For reasons outlined under Ski Area Capacity in Chapter 3, this assessment focuses on skier capacity, based on the acreage of developed terrain and the skier densities required to provide a particular kind of skiing experience. The skier densities used in the following trail-capacity analysis reflect this consideration, blending the higher densities anticipated on conventional trails in the CAT III area with lower densities on gladed runs and open bowls. It should also be noted that the acreage projections used are conservative, comprising only ski terrain identified by VA as meeting their quality standards. The acreages used in assessing effects on other resources such as soils, wildlife or vegetation may differ somewhat. Table 4.11 summarizes the current trail capacity as well as an analysis of trail-capacity change under each alternative. Figure 4.23 depicts the overall trail capacity for Vail Ski Area under the current and projected conditions for each alternative relative to the 19,900 SAOT manage-to capacity. The reader is reminded that any capacity shown in excess of 19,900 is hypothetical because of the reasons discussed earlier involving the 19,900 SAOT threshold.

There are several figures which are essential to understanding Table 4.11 and the histograms that depict key aspects of that table. These figures represent trail capacity in terms of skier numbers, calculated on the basis of Vail Ski Area's skier-per-acre quality criteria. The first key figure is the 19,900 SAOT manage-to capacity threshold which cannot be exceeded without further environmental analysis. The second figure is 14,258 which is the trail capacity on the front side of Vail Ski Area based on VA's desired skier densities. Similarly, the Back Bowls could accommodate 7,824 skiers. Considering existing lifts and other facilities, the 14,258 figure is a reasonable estimate of real front-side skier capacity, but the 7,824 figure for the Back Bowls is not realistic. A more accurate number for skier capacity of the Back Bowls is 3,645 given current lift capacities.

Subtracting 14,258 from 19,900 yields 5,642 skiers, which is the number of skiers to be accommodated somewhere other than the front side on a near-capacity day. Given the actual skier capacity of the Back Bowls (3,645) and the need to accommodate 5,642 skiers when the manage-to capacity of 19,900 SAOT is reached, there is an existing capacity deficit of 1,997. Similarly, on a day that approaches 19,900 skiers when the Back Bowls are not available for use, this deficit increases to about 5,642. These figures address overall trail capacity without regard to skier ability or terrain preferences. The picture becomes more focused when considering only intermediate skiers.

Approximately 50 percent of Vail skiers indicate that they ski at the intermediate level. Thus, the raw need for intermediate terrain is calculated as 50 percent of the 19,900 capacity, or 9,950 skiers. Since intermediate skiers

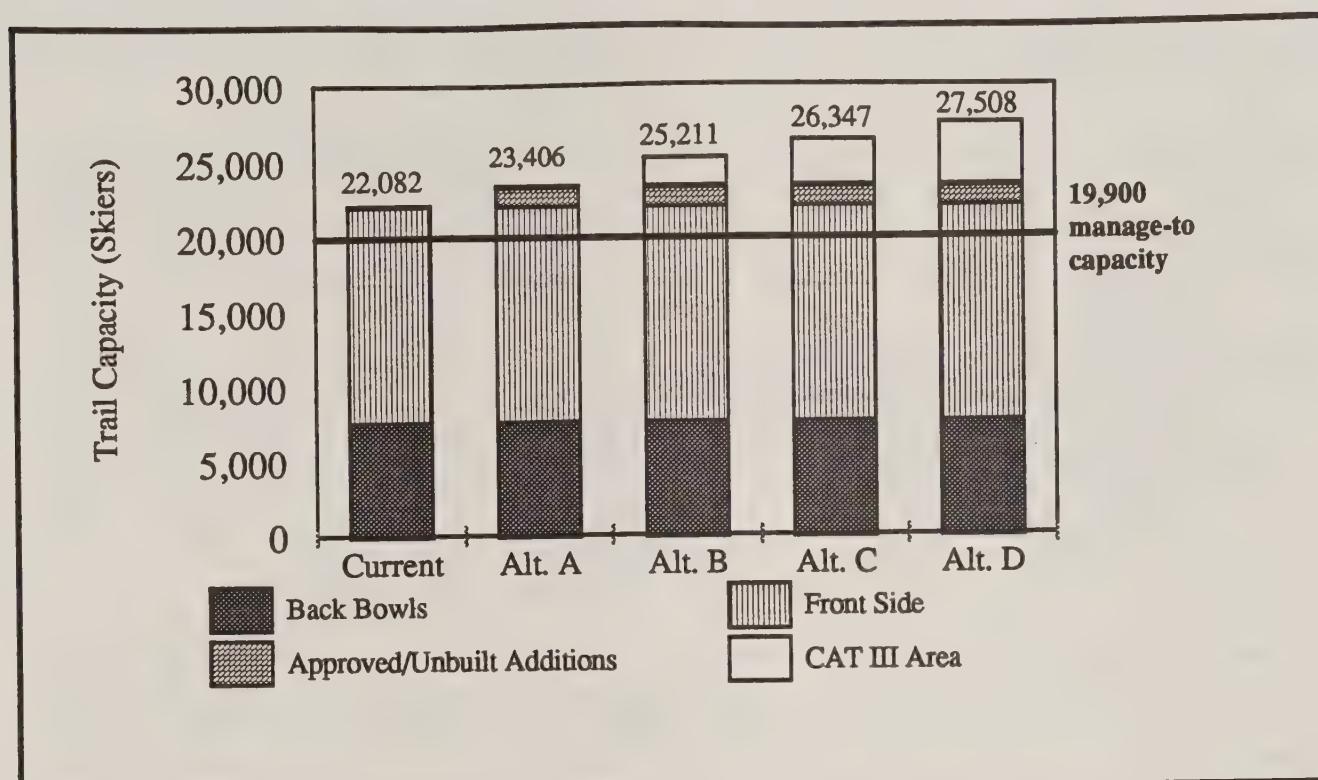


Figure 4.23. Trail capacity increases relative to the 19,900 manage-to capacity threshold.

comprise a large and growing segment of the skier market, VA has stated in their proposal to the Forest Service the need to provide adequate terrain to accommodate intermediate skiers under conditions that reflect the traditional Vail Ski Area quality standards. Current intermediate terrain capacity is 4,690 skiers on the front side and 3,329 skiers in the Back Bowls, for a total of 8,019 skiers. Subtracting 8,019 from 9,950 leaves a deficit of 1,931 skiers, the current shortfall of intermediate terrain. Add to that the number of intermediate skiers displaced when the Back Bowls are closed or use is limited, and the deficit is 5,260 during peak periods.

The preceding discussion illustrates a primary goal of developing the CAT III area: to accommodate from 1,997 skiers on a near-capacity day, to 5,642 skiers on a near-capacity day with the Back Bowls unavailable for use. For intermediate skiers, the deficit to be made up ranges from 1,931 to 5,260 skiers. The following sections on Trail Capacity, Reliability of Skiing, and Terrain Mix assess the effects of the alternatives in addressing these capacity deficits.

Alternative A - No Action

Trail Capacity

Based on VA's skier-per-acre density, the current trail capacity of the Vail Ski Area is 22,082 (Table 4.11). Under the No Action Alternative, trail capacity would increase by 1,324 skiers to 23,406 if currently approved improvements and construction were completed. The practical or manage-to capacity would remain at 19,900 SAOT. While this minor change in trail capacity could occur, the possibility noted above for more frequent peak days associated with increased day skiers could reduce VA's ability to maintain the desired densities on all parts of the mountain. This could result simply from natural skier preferences and flow patterns, but any mismatch between the mix of skier ability and terrain difficulty, or any constraint to use of the Back Bowls, would worsen

such a problem. These issues are addressed below. In principle, however, current trail capacity should remain adequate under most conditions, providing the Back Bowls are available.

Without lift development, Back Bowl utilization would continue to be limited by the current lift configuration. This underlies the 1,997 deficit in overall skier capacity noted in the introduction to this section. In the event of a mechanical failure of Lift 21, the ski area would lose about 1,800 skiable acres in Tea Cup and the bowls to the east.

Capacity Utilization

As noted above, the changes to the overall quality of the skiing experience offered by Vail Ski Area under the No Action Alternative would do little to attract the additional destination skiers required to increase off-peak skier visitation. The profile of daily skier visits across a given season (see Figure 3.8) would probably not change noticeably.

Alternatives B, C and D - Center Ridge, Proposed Action and MDP Alternative

Trail Capacity

As indicated in Table 4.11, these alternatives would add incrementally to trail capacity, increasing the ski area's total to 25,211, 26,347 or 27,508 skiers, respectively, if currently approved terrain developments outside the CAT III area which comprise the No Action Alternative also occurred. Increases of these magnitudes should allow VA the latitude to maintain desired densities with the number of skiers possible under the 19,900 SAOT manage-to threshold under most conditions. Shifts due to skier preferences on a given day should pose no problem, and more flexibility in matching different mixes of skier ability would be achieved.

The proposed lift in Tea Cup Bowl would provide additional uphill capacity in the Back Bowls. This would minimize the effective capacity loss resulting from the current lift-capacity limitation in the Back Bowls and from failure of Lift 21.

In short, while capacity is not generally a problem and is not directly a focus of the proposed development, new capacity would offset some recurrent problems. Greater development would do more in this regard, so the Center Ridge Alternative would have the least effect, the MDP Alternative the most.

Capacity Utilization

The attraction of new terrain diversity and overall improvement in the quality of Vail Ski Area's alpine skiing experience would improve substantially with the CAT III area development. Since these are among the key characteristics necessary to attract destination skiers, the development would allow VA increased leverage in building off-peak skier visitation.

As noted above under Skiing Quality, the positive impact on overall quality of the ski experience offered would increase from the Center Ridge Alternative, through the Proposed Action to the MDP Alternative. Since no targets for increased off-peak skier numbers have been established, the assumption is that more such skiers would be perceived as better, and that the potentially significant, positive impact would increase in the same order.

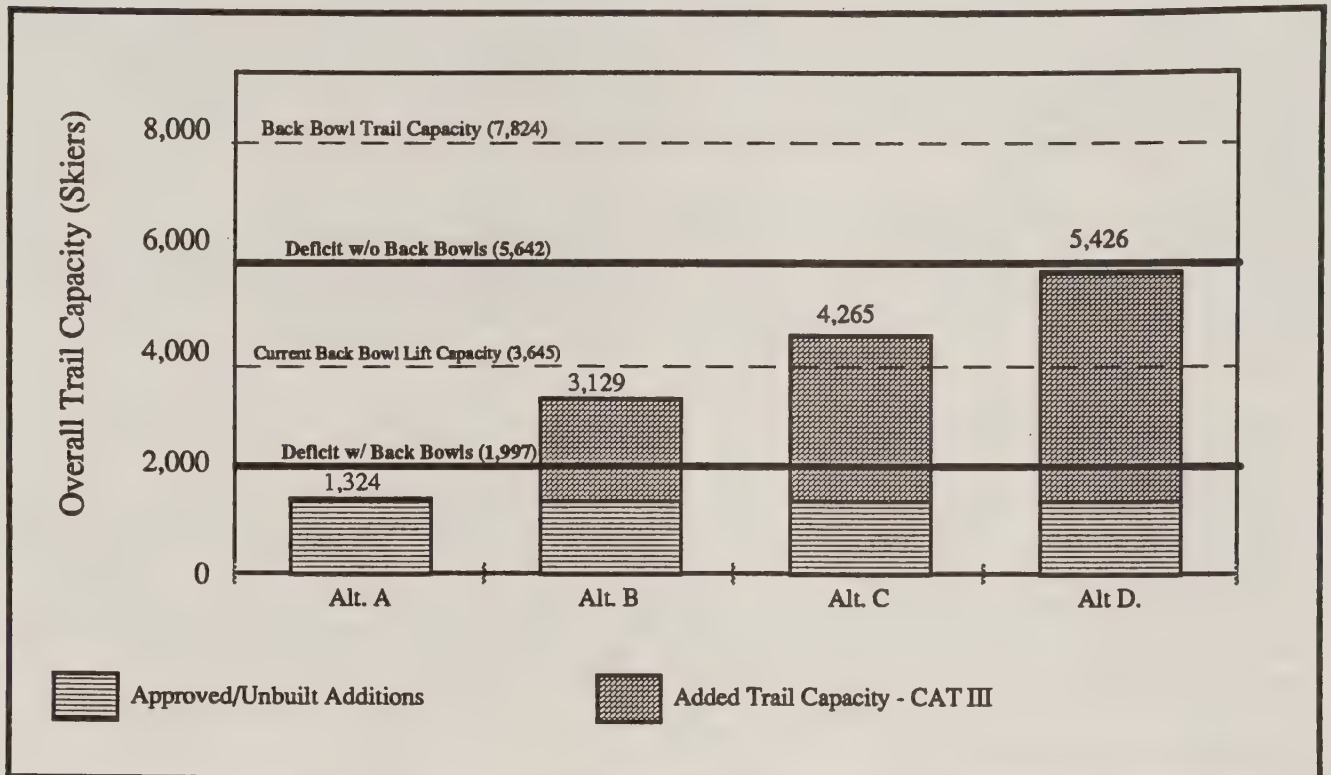


Figure 4.24. Overall trail capacity by alternative compared to existing and potential deficits. (Note: Deficits with Back Bowls is based on Back Bowls lift capacity [3,645] not trail capacity [7,824].)

4.4.3.5.1.4. Reliability of Skiing

Offering more consistent and reliable skiing, particularly early and late in the season, and improving skier distribution are among the key aspects of the purpose and need for this proposal (Chapter 1). As outlined in Chapter 3, Reliability of Skiing, adverse conditions in the Back Bowls can limit skier use of the area, resulting in front side crowding and a decline in the overall quality of skiing when it occurs during peak periods. Figure 4.24 depicts the degree to which overall capacity deficits would be offset by the alternatives for CAT III area development.

Alternative A - No Action

Developments planned under the No Action Alternative would primarily improve front side opportunities for a small number of beginning and advanced level skiers and might thus help reduce any crowding associated with limited use of the Back Bowls. Other than this, little change from current conditions is anticipated under this alternative. Overall, Vail Ski Area would continue to be vulnerable to trail-capacity limitations during peak periods when weather or snow conditions limit or preclude skiing the Back Bowls.

Alternatives B, C and D - Center Ridge, Proposed Action, and MDP Alternative

The CAT III area is similar to the front side in terms of exposure and snow accumulation and retention. The higher elevations of the area are generally more open than the front side, but not so open as to cause the visibility

problems that often occur in the Back Bowls. Development of the CAT III area would effectively offset some of the adverse impact on skier densities or overall skiing quality resulting from limited use of the Back Bowls. For this reason, the CAT III area can be thought of as an "insurance policy" against the damage done to the quality of Vail's skiing because of poor conditions in the Back Bowls, particularly during peak periods.

The magnitude of this offset would vary by alternative. As indicated in Table 4.11 above, the Center Ridge Alternative would add (in addition to the 1,324 under No Action) 1,805 to trail capacity, versus a loss of 5,642 when the Back Bowls are not in use. The Proposed Action would add 2,941, a more substantial offset, and the MDP Alternative would add 4,102 (Figure 4.24). Again, the magnitude of positive impact would increase in proportion to the extent of the development, but should be significant under any alternative.

4.4.3.5.1.5. *Terrain Mix*

Provision of additional intermediate skiing terrain is a central element of the development's purpose (Chapter 1). As noted in Chapter 3, Terrain Mix, 50 percent of Vail's skiers rate themselves in the intermediate category, while only about 36 percent of the ski area's trail capacity falls in this category. On peak days or when conditions limit use of parts of the area, this can result in crowding of intermediate slopes or skier dissatisfaction with terrain availability. Figure 4.25 depicts the intermediate trail capacity added under each alternative relative to the potential deficit as use approaches 19,900 SAOT with and without use of the Back Bowls.

Alternative A - No Action

The terrain currently approved for development is classified mostly as beginner or advanced. Thus, if all approved terrain were developed, this alternative would lower the percentage of total capacity in the intermediate category to 35.

Alternatives B, C and D - Center Ridge, Proposed Action and MDP Alternative

As indicated in Table 4.11, the development alternatives would increase the proportion of intermediate terrain at the ski area marginally if at all, to 36, 37 and 36 percent, respectively. However, the Center Ridge Alternative would add 927 to intermediate terrain trail capacity, the Proposed Action 1,610, and the MDP Alternative 1,718. Since these additions would be part of a capacity buffer in excess of the ski area's SAOT limit, they would work against the intermediate deficit more than the basically unchanged proportions indicate.

This is demonstrated by calculating the actual number of intermediate skiers in a 19,900 peak-day total and comparing this figure to the skier totals accommodated under the development alternatives. Fifty percent of 19,900 is 9,950 intermediate skiers. As Table 4.11 shows, the Center Ridge Alternative would increase intermediate terrain capacity to only 9,036, while both the Preferred Alternative and the MDP Alternative would closely approach the 9,950 figure, a substantial improvement. Since industry-wide trends suggest a growing proportion of intermediates in the skiing population, this gain in intermediate capacity may become increasingly significant.

4.4.3.5.1.6. *Skier Densities*

Concern over potential increases in skier densities was expressed during scoping. Chapter 3, Skier Densities, describes the situation on the upper Flapjack trail during end-of-day egress and congestion in the Mid-Vail area, particularly at mid-day. The concern is that CAT III area skiers might add to densities on Flapjack late in the day,

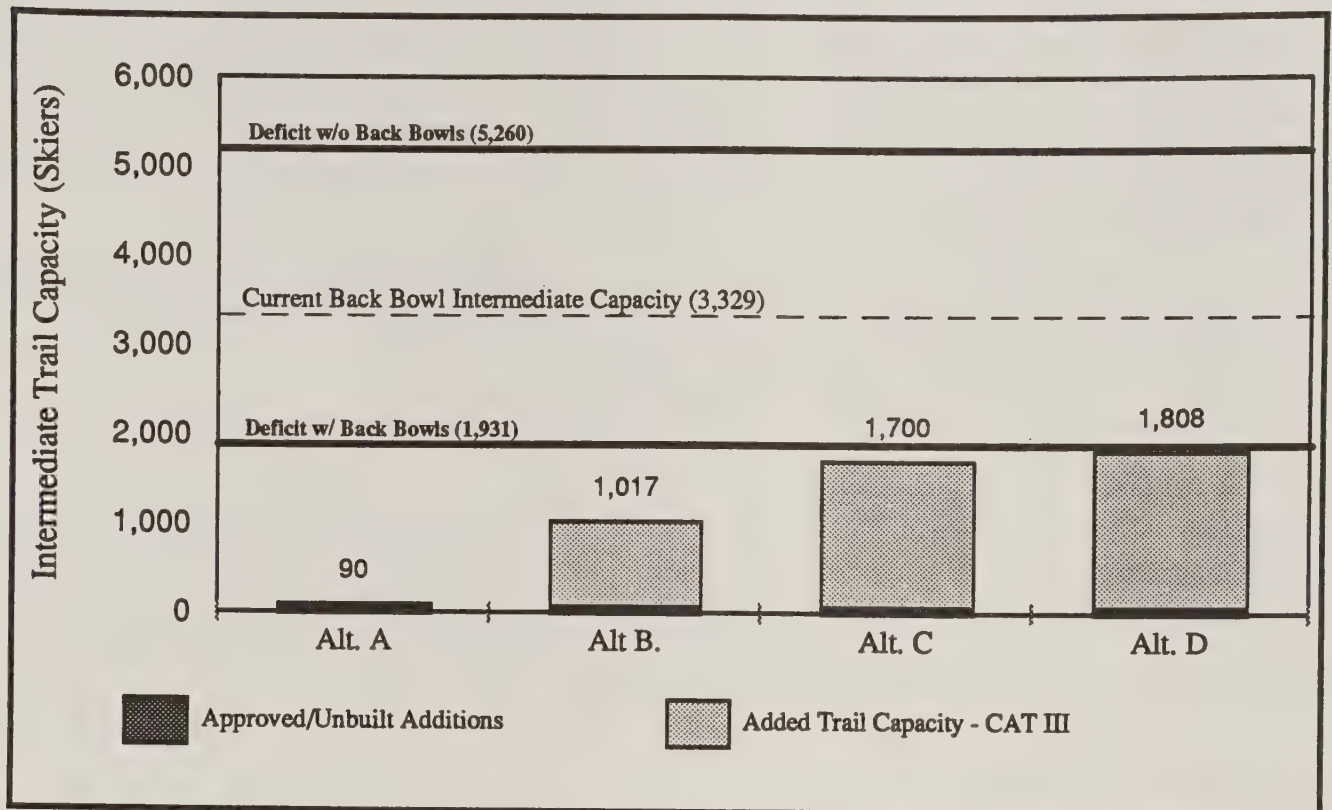


Figure 4.25. Comparison of additional intermediate trail capacity by alternative to potential deficits.

and that skiers bound for the CAT III area and more skiers in general would worsen Mid-Vail congestion. These issues are addressed below.

Alternative A - No Action

Potential problems associated with higher peak-day skier densities on Flapjack trail can occur under present conditions. However, VA's experience, supported by a recent circulation capacity study completed by VA (Larson, *pers. comm.*, 1995), indicates that such problems can be adequately addressed by implementing standard, passive, skier management measures (i.e., signing, fencing, and other skier traffic controls). VA could implement more of these measures should higher skier numbers warrant it, avoiding any significant problem.

In regard to Mid-Vail congestion, a recent upgrade of Lift 3 to a detachable quad will help reduce skier densities by moving skiers out of the area faster. Some lunchtime congestion is likely to continue in the area since Mid-Vail will remain a major food service outlet.

Alternatives B, C and D - Center Ridge, Proposed Action and MDP Alternative

The primary consideration in assessing the impact of the development on end-of-day skier densities on Flapjack is understanding the circulation capacity study cited above. The study concludes that crowding would occur only on days when the 19,900 SAOT manage-to capacity is approached, and that it would be manageable through normal circulation control measures used by VA. Since the manage-to capacity would not change under any development alternative, this conclusion would not change.

It should be noted, however, that if more peak-day skiers were using the CAT II and CAT III areas than currently use the CAT II area alone, skier densities on Flapjack would increase as these skiers left the back side. This would mean that control measures might be employed more frequently. As outlined above under the headings of Skiing Quality and Ski Area Capacity, CAT III area skier numbers would likely increase with the amount of terrain developed. As a result, this relatively minor negative impact might increase from the Center Ridge Alternative through the MDP Alternative.

This same pattern would describe potential impacts to congestion at Mid-Vail. More skiers passing through the area to access the CAT III area would add to congestion, as would more skiers overall. This adverse impact would not be significant, especially in light of the Lift 3 upgrade. In addition, construction of a restaurant in the CAT III area could alleviate some mid-day crowding at Mid-Vail.

4.4.3.5.1.7. CAT III Area Access

The concern identified in Chapter 3, CAT III Area Access, is whether the CAT III area is too far from the base area to be effectively accessed and supported by existing or proposed ski-area infrastructure. This relates indirectly to the aspects of the development's purpose regarding provision of backup lift capacity into and out of the Two Elk Creek drainage and improvement of skier utilization of the Back Bowls (Chapter 1). These issues are addressed below. Figure 4.26 schematically presents the major access routes and transit times into the CAT III area.

Alternative A - No Action

Several approved improvements to lifts on the front side which improve access to the Back Bowls have been completed or are slated for completion over the next couple of years. Because of their positive impact on front side circulation, these improvements would be part of any alternative selected. They include:

- ◆ Upgrading Lift 3 to a detachable quad, which reduces pressure on Lift 4 and speeds access to the Back Bowls.
- ◆ Replacing Lift 6 out of Golden Peak and extending it so that skiers can load Lift 10 or Lift 11 directly and access the summit and the Back Bowls. Lift 10 is also scheduled to be upgraded. These improvements will provide another effective portal into the Back Bowls.
- ◆ Other lift development and upgrades to improve skier circulation.

These improvements would facilitate adequate access to the CAT II and CAT III areas, but egress would continue to be limited to Lift 21. This would pose a problem for skier evacuation if the lift were inoperative. To some extent, the previously approved construction of Lift 22 in Mongolia Bowl would offset this situation.

Alternatives B, C and D

Under all these development alternatives, the Tea Cup Lift would be built, significantly improving egress from the Back Bowls and the CAT III area. Uphill capacity would increase and, perhaps more importantly, redundant capacity would minimize the impact of Lift 21 being out of service. It should be noted that response and evacuation times for skier injuries in the CAT III area would not vary substantially from the Back Bowls. From either side, injured skiers would have to be brought down to Two Elk Creek before being taken out via one of the

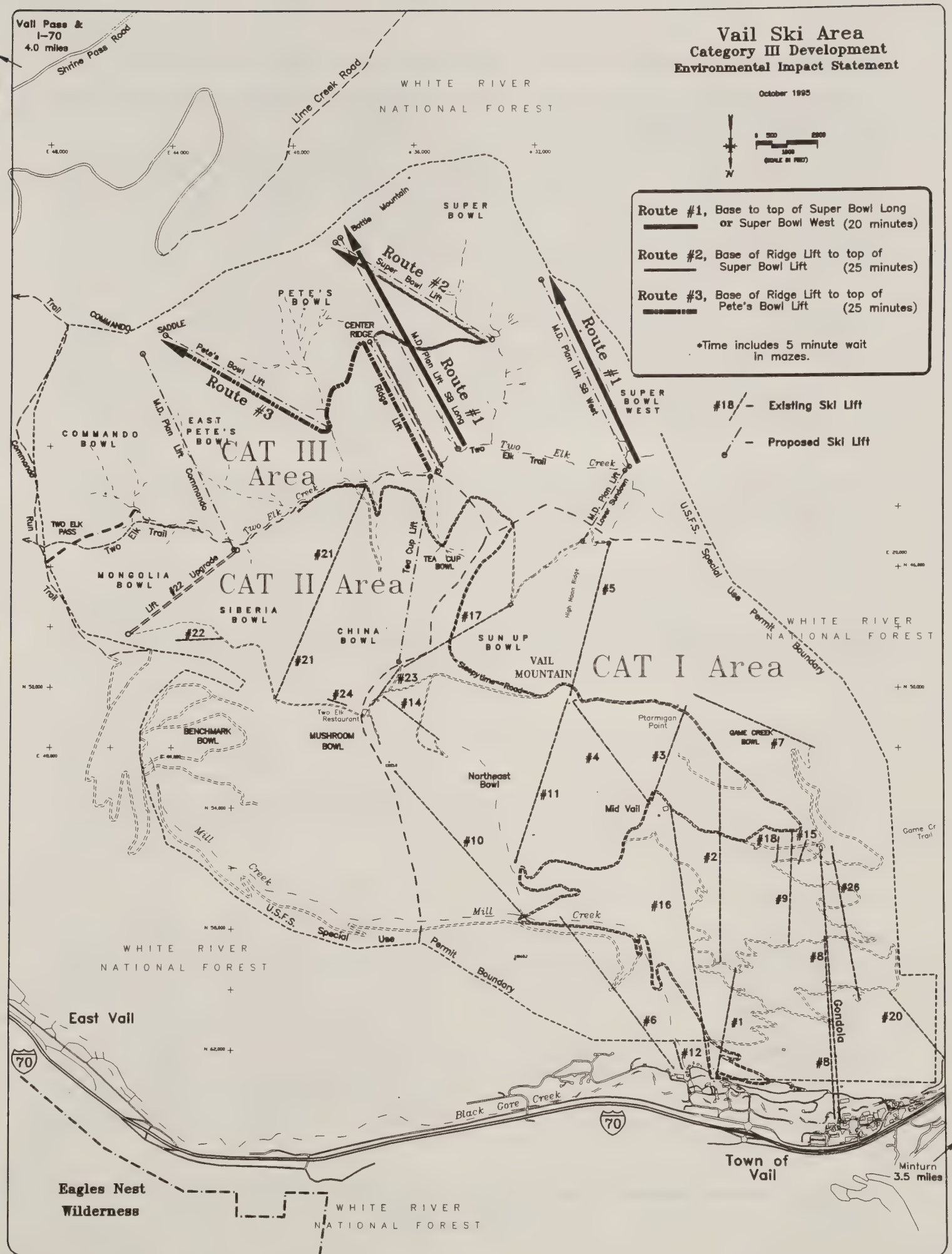


Figure 4.26. Major proposed access routes and associated transit times into the CAT III area.

egress lifts. The Tea Cup Lift could also be downloaded to get skiers to the CAT III area when use of the Back Bowls was limited because of poor snow conditions.

In terms of lift capacity into the CAT III area, under the Center Ridge Alternative the Ridge and Super Bowl Lifts would access the western flank of Pete's Bowl and the eastern flank of Super Bowl. The Proposed Action would add the Pete's Bowl Lift, accessing most of Pete's and East Pete's bowls. Under the MDP Alternative, the Super Bowl Long, Super Bowl West, and Lower Sun Down Lifts would be built, and Ridge and Super Bowl Lifts would not. Figure 4.26 indicates these access routes and transit times.

In regard to other services for the CAT III area skiers, a picnic deck, a warming hut and a ski patrol facility would be constructed under the Center Ridge Alternative. The Proposed Action would add an additional restaurant at the bottom of Pete's Bowl, another picnic deck, another warming hut, and another ski patrol facility. Another warming hut and ski patrol facility would be added under the MDP Alternative. These should provide adequate services for CAT III area skiers regardless of the distance from front side and base area facilities. Services under the Center Ridge Alternative would be minimal. Under the other two development alternatives they should be ample.

In light of these approved and proposed improvements to lifts and other support facilities, the distance of the CAT III area from the rest of the ski area's infrastructure should pose no significant problem under any development alternative.

4.4.3.5.1.8 Skier Safety and Management

This section discusses concerns about snow avalanche and out-of-area skiing. VA's snow safety program is recognized as meeting state-of-the-art industry standards. Key elements of the program are avalanche control and management of out-of-area skiing. The Skier Safety and Management section of Chapter 3 outlines current conditions in these areas.

Alternative A - No Action

Avalanche hazard under the No Action Alternative would be basically the same as described in Chapter 3. There would be no change to the developed ski area boundary in the Back Bowls. To discourage out-of-area skiing in the CAT III area, the roped and signed boundary would remain along the CAT II/CAT III area boundary, generally following Two Elk Creek.

Alternatives B, C and D - Center Ridge, Proposed Action and MDP Alternative

Under the Center Ridge Alternative, two lifts (Super Bowl and Ridge) and associated ski trails would be constructed on the east side of Super Bowl and the west side of Pete's Bowl. On the north side of Two Elk Creek, the Tea Cup Lift and a few associated ski trails would be developed. None of these lifts or trails intersect avalanche pathways.

All action alternatives would provide lift access to the CAT III area and Battle Mountain ridge. This would create the potential for skiers to leave the managed ski area and enter the backcountry. As noted in Chapter 3, Forest Service policy generally allows for public use of lifts to enter the backcountry unless especially hazardous conditions exist. Specific boundary management actions and closures are typically dealt with in the Boundary Management Plan prepared by VA and the Forest Service.

Under the Proposed Action, Super Bowl, Ridge, and Pete's Bowl lifts and numerous associated ski trails would be developed on the east side of Super Bowl, in Pete's Bowl, and on the west side of East Pete's Bowl. In addition, the Tea Cup Lift and associated ski trails would be constructed. All four lifts and the trails in Super, Pete's and Tea Cup Bowls avoid known avalanche hazards. Avalanche pathways D and E intersect parts of ski trails 3B' and 3C in East Pete's Bowl. These pathways can be controlled using standard snow-safety practices.

Under the MDP Alternative, the Super Bowl West, Super Bowl Long, and Commando Lifts and associated ski trails would be constructed south of Two Elk Creek. In addition, the Tea Cup Bowl Lift and Lower Sun Down Lift and associated ski trails would be developed north of Two Elk Creek. The top terminal of the Super Bowl West Lift is located in avalanche pathway N. The avalanche hazard associated with this pathway can be controlled with standard control practices. All the other lifts avoid known avalanche pathways. Under the MDP Alternative there also would be extensive ski trails in the Commando Bowl. In this bowl, ski trail CBB intersects avalanche pathway B and ski trails CBD, CBE, CBF, and CBG intersect avalanche pathway C. Avalanche pathway B can be controlled by ski cutting, while avalanche pathway C would likely require explosives.

4.4.3.5.2 Potential Mitigation

A discussion of standard mitigation measures and potential mitigation measures that are project specific for each resource are discussed in Chapter 2. Table 2.11 summarizes the major measures noting their effectiveness and the organizations responsible for authorizing and implementing them.

The only potential negative impact to alpine skiing not inherently mitigated by the proposed development is crowding on upper Flapjack during late afternoon egress. More skiers, or a higher proportion of skiers, using the Back Bowls and the CAT III area could result in skier densities which posed a threat to the quality of the experience. Skier management techniques such as signing, fencing and other skier traffic controls are currently being used and could be expanded should conditions warrant it. The efficacy of these measures should be monitored, and alternatives should be identified and employed if necessary.

In regard to skier safety and management, standard avalanche control and skier management practices would preclude any significant adverse impact.

4.4.3.5.3 Unavoidable Adverse Impacts

No unavoidable impacts to alpine skiing resulting from any development alternative have been identified in this analysis.

4.4.3.5.4 Cumulative Impacts

A number of other ski areas in the region could be incorporated into an analysis of the cumulative effects of the proposed CAT III area development on alpine skiing. Other resorts along I-70 east of Vail are likely candidates, or other major destination resorts in Colorado and elsewhere could be included. While Vail Ski Area is certainly part of a larger complex, impact analysis would become increasingly speculative as it extended farther afield. Therefore, this analysis focuses on other ski areas existing in the vicinity as well as new ski-area development or expansion in the foreseeable future. In that the need for the development in terms of supply and demand has been addressed quantitatively—in terms of SAOT and skier visits—above, this section emphasizes more qualitative aspects.

VA also owns and operates Beaver Creek Ski Area and Arrowhead at Vail. Beaver Creek is about 13 miles west of Vail. It offers approximately 1,100 acres of skiable terrain with a capacity of about 7,500 SAOT. The Forest Plan cites approved expansion capacity both inside and outside the SUP boundary.

Skier visitation has grown steadily since the area opened in 1980 to over 504,000 in 1993/94. Beaver Creek features conventional trails and a well balanced mix of terrain. The base area and mountain village are modern, up-market and well integrated. Destination skiers are the major part of Beaver Creek's market, but they differ from Vail visitors in that they include more families, and more are second home owners in the immediate area.

Arrowhead, also located about 13 miles west of Vail, was a very small resort catering to second home owners and other local skiers. VA acquired it in 1993. VA has undertaken development plans which will eventually link Arrowhead with Beaver Creek and develop ski facilities and residential properties in the intervening Bachelor Gulch area. With about 170 skiable acres and a current capacity of about 1,000 SAOT, Arrowhead is not a major component of the area's alpine skiing scene, but its developing role as a portal into the larger skiing and residential complex comprising Arrowhead, Bachelor Gulch and Beaver Creek will likely increase its prominence.

As suggested by their shared VA ownership, these areas are being developed to complement rather than compete with Vail Ski Area. The terrain mix, the overall alpine skiing experience offered, and the clientele served differ enough that each area has its own identity, while collectively they make a well balanced whole. As a result, the CAT III area development, when viewed in conjunction with continued development of these other VA-owned areas, poses the potential for a cumulative improvement in alpine skiing.

The other existing ski area in the vicinity of Vail is Ski Cooper, a small, family-oriented area about 25 miles south of Vail on U.S. Highway 24. The area's current capacity is about 1,600 SAOT, with approved expansion capacity of 1,700 SAOT within the SUP boundary and potential for 1,430 SAOT outside the boundary. Cooper offers terrain amenable primarily to beginning and intermediate skiers, most of whom are local day skiers from Lake County and the Colorado Springs area. Some destination skiers visit the resort, most of them using accommodations in Leadville. Because of Ski Cooper's size, distance, and fairly distinct clientele, its contribution to cumulative impacts with the proposed the CAT III area development is negligible.

Another important ski development to consider in terms of cumulative impacts is the proposed Adam's Rib Resort Development. The site for this proposed large, four-season resort is about 45 miles west of Vail. The Forest Service SUP authorizing a 9,000 SAOT capacity was issued in 1982. However, the project is now on hold pending completion of a supplemental EIS being prepared by the Forest Service and the U.S. Army Corps of Engineers to address potential impacts of both the on-mountain and base-area developments. A decision is expected as early as 1996, but other permits and approvals would be required before construction could begin. Potential expansion capacity of 3,000 SAOT outside the SUP boundary is noted in the Forest Plan.

This resort would focus primarily on the destination skier market, which would place it in competition with Vail Ski Area and the Beaver Creek/Arrowhead complex regionally. In terms of terrain and overall skiing experience, Adam's Rib as currently conceived would approximate Beaver Creek/Arrowhead more closely than Vail, which would reduce direct competition with Vail. In light of these similarities, the cumulative impacts of the CAT III area development and Adam's Rib development would be an expanded range of options for local and destination skiers tempered by an element of competition.

All in all, when the proposed CAT III area development's impacts on alpine skiing are viewed in the context of the region, the picture which emerges is positive. All of the cited benefits to Vail Ski Area skiing would accrue

to the region as a whole, providing an expanded range of skiing opportunities and an overall improvement in skiing quality. The only notable cost is the potential competition with Adam's Rib for destination skiers noted above. In that Adam's Rib will require some time for completion, this impact cannot be considered significant.

4.4.4 SOCIOECONOMICS

4.4.4.1 Direct and Indirect Impacts

Current conditions and issues regarding potential socioeconomic impacts are outlined under this heading in Chapter 3. Readers are encouraged to refer to this information as background for the impact assessment outlined below.

As stated in Chapter 3, the Proposed Action and action alternatives could trigger socioeconomic impacts in two ways: through potential increases in off-peak skier numbers and through additional VA employees. These variables are defined below.

Skier Numbers

It is difficult to predict the impact of the various action alternatives on skier visitation given the number of variables involved. Some of these variables, including lift-pass pricing, snowmaking, marketing promotions and special travel arrangements, are controlled by the resort's management. Others, such as climatic variability and economic conditions from local to international levels, are basically uncontrollable. The major existing limitation to skier numbers is the Forest Service requirement that VA adhere to the manage-to strategy with its 19,900 SAOT manage-to capacity. The manage-to program is established in VA's MDP as a condition of their Forest Service SUP. Beyond that, the Agreement with the TOV reaffirms the manage-to program. Existing village infrastructure limitations (e.g., parking, transportation, and beds) are generally in balance with the manage-to capacity, and significant changes to this situation appear unlikely.

Within these broad limitations, projected annual skier numbers are estimated using the assumptions for each alternative noted in Table 4.12. The main purpose of the extrapolations presented in Table 4.12 is to provide a means of estimating sales tax revenue. The development is intended to increase annual skier visitation by increasing off-peak numbers at daily levels below 19,900. Aside from the estimates of sales tax revenue, the potential socioeconomic impacts associated with increasing annual skier numbers are assessed on the basis of general trends.

Quantified projections of skier visitation have been made on the basis of bracketed long-term growth rates ranging from 0.5 to 3.0 percent annually (Frick 1995). However, because of the effect of 19,900 manage-to limit and its leveling effect on peak-day impacts, the MDP Alternative, Proposed Action, and Center Ridge Alternative have been grouped for the purpose of this analysis. These action alternatives are contrasted with the No Action Alternative.

The primary difference between the No Action Alternative and the action alternatives in regard to skier numbers is that it would be more difficult to maintain or increase current growth in season-long numbers under the No Action Alternative. Annual skier days at Vail Ski Area have increased at just under 2 percent per year since 1983, to about 1.5 million. Each additional percentage-point of increase at this time would equate to 15,000 more skier days through the course of the average 142-day ski season. This number, in turn, is the equivalent of 41 year-round residents, which is less than 0.2 percent of the County's current population.

Table 4.12. Estimated annual sales tax revenue based on skier visitation by alternative from the 1994/95 through 2005/06 seasons

		Alternative A				Alternative B			
Year	Estimated Annual Skier Visits (Millions of skiers)	Estimated Annual Sales Tax Revenues (Millions of dollars)		Estimated Annual Skier Visits (Millions of Skiers)		Estimated Annual Sales Tax Revenues (Millions of dollars)			
	Range of Annual Growth Estimates				Range of Annual Growth Estimates				
	0.5 %	1.0 %	0.5 %	1.0 %	1.0 %	2.0 %	1.0 %	2.0 %	
94/95 (0)	1.568	1.568	21.047	21.047	1.568	1.568	21.047	21.047	
95/96 (1)	1.576	1.584	21.153	21.258	1.576	1.584	21.123	21.258	
96/97 (2)	1.584	1.600	21.258	21.470	1.584	1.600	21.258	21.470	
97/98 (3)	1.592	1.616	21.365	21.685	1.592	1.616	21.365	21.685	
98/99 (4)	1.600	1.632	21.472	21.902	1.608	1.648	21.578	22.119	
99/00 (5)	1.608	1.648	21.579	22.121	1.624	1.681	21.794	22.561	
00/01 (6)	1.616	1.665	21.687	22.342	1.64	1.715	22.012	23.012	
01/02 (7)	1.624	1.681	21.795	22.566	1.657	1.749	22.232	23.473	
02/03 (8)	1.632	1.698	21.904	22.791	1.673	1.784	22.454	23.942	
03/04 (9)	1.640	1.715	22.014	23.019	1.690	1.820	22.679	24.421	
04/05 (10)	1.649	1.732	22.124	23.249	1.707	1.856	22.906	24.909	
05/06 (11)	1.657	1.750	22.234	23.482	1.724	1.893	23.135	25.408	
Year	Alternative C				Alternative D				
	Estimated Annual Skier Visits (Millions of Skiers)		Estimated Annual Sales Tax Revenues (Millions of dollars)		Estimated Annual Skier Visits (MILLIONS of Skiers)		Estimated Annual Sales Tax Revenues (Millions of dollars)		
	Range of Annual Growth Estimates				Range of Annual Growth Estimates				
	1.5 %	3.0 %	1.5 %	3.0 %	2.0 %	3.0 %	2.0 %	3.0 %	
	94/95 (0)	1.568	1.568	21.047	21.047	1.568	1.568	21.047	21.047
95/96 (1)	1.576	1.584	21.253	21.258	1.576	1.584	21.153	21.258	
96/97 (2)	1.584	1.600	21.258	21.470	1.584	1.600	21.258	21.470	
97/98 (3)	1.592	1.616	21.365	21.685	1.592	1.616	21.365	21.685	
98/99 (4)	1.600	1.632	21.472	21.902	1.600	1.632	21.472	21.902	
99/00 (5)	1.608	1.648	21.579	22.121	1.608	1.648	21.579	22.121	
00/01 (6)	1.632	1.698	21.903	22.785	1.616	1.665	21.687	22.342	

01/02 (7)	1.657	1.749	22.231	23.468	1.624	1.681	21.795	22.566
02/03 (8)	1.681	1.801	22.565	24.172	1.657	1.732	22.231	23.243
03/04 (9)	1.707	1.855	22.903	24.897	1.690	1.784	22.676	23.940
04/05 (10)	1.732	1.911	23.247	25.644	1.723	1.837	23.129	24.658
05/06 (11)	1.758	1.968	23.595	26.414	1.758	1.893	23.592	25.398

Assumptions:

- Annual Skier Visits would grow from 0.5-1.0%, 1%-2%, 1.5%-3%, and 2%-3% for Alternatives A, B, C, and D, respectively.
- Sales tax rates are 8% of gross skier expenditures (3% for state, 1% for Eagle County, 4% for the Town of Vail).
- Destination-skiers spend \$190 per day and comprise 70% of the skier visits, while day-skiers spend \$50 per day and comprise 30% of the skier visits.
- In order to standardize comparisons, benefits from sales tax revenues due to increased skier visitation are depicted as beginning to accrue during the year following completion of construction. These years are 0, 4, 6, and 8, for Alternatives A, B, C, and D, respectively.

The destination skier is the key factor in building skier visitation during non-peak periods and on a season-long basis. The dependability and attraction of the CAT III area would be an important ingredient in attracting more destination skiers. Without CAT III area development, it may be necessary to target the Front Range day-skier market to maintain or increase skier numbers. This shift would have several major implications which are detailed below.

To summarize the situation, the No Action Alternative could precipitate either a decline in skier numbers or an increased proportion of day skiers in a stable or growing total. Conversely, the action alternatives should help maintain or increase current rates of growth in annual skier visitation and retain the area's attraction to destination skiers.

Additional VA Employees

Additional VA employees, the second potential source of impacts, are more readily quantifiable. Table 4.13 indicates the number and type of new positions anticipated under the alternatives being considered. These numbers are the basis of the impact assessment outlined below. Differences among the action alternatives will be identified as appropriate.

It should be noted that the additional employees associated with these alternatives would augment normal growth in VA's staff. Since 1988, VA's employee numbers have grown at an average annual rate of about 6 percent (unpublished VA 1995 data). This baseline trend would likely continue.

Of the additional employees associated with CAT III development alternatives, the administrative personnel would likely be full-time, year-round staff. At the other extreme, most of the lift operators and food service employees would be temporary seasonals, staying with VA for only a season or two. The remaining ski patrol, skier services and grooming employees would generally be regular seasonals, residing in the area and working for VA for a number of years (Flynn 1995). Each of these categories thus poses different potential socioeconomic impacts.

Table 4.13. Potential additional VA employees by alternative.

Employment Type	Alternative			
	A - No Action	B -Center Ridge*	C- Proposed Action*	D - MDP *
Lift Operators	18	12	16	16
Ski Patrol	2	5	6	7
Skier Services	2	1	2	2
Grooming	3	2	4	7
Administration	10	3	4	4
Food Services	20	0	39	39
Total	55	23	71	75

*Note: Employees under action alternatives are in addition to those under the No Action Alternative.
(Source: VA unpublished projections.)

To put these employee numbers in the proper perspective, the current size and growth rates of the County's resident population and workforce should be noted. The State of Colorado (Department of Local Affairs 1995) estimated Eagle County's 1993 resident population at 25,623, indicating an annualized growth rate from 1985 through 1993 of 4.5 percent. The Department of Labor and Employment (1994) estimated the County's 1993 workforce at 14,483, growing at 2.7 percent annually from 1985 to 1993.

Comparing the projected numbers of new VA employees who would reside in the area (all but the temporary seasonals noted above) to these numbers indicates that even if all the new employees had been hired in 1993 they would comprise less than 0.1 percent of the resident population. Likewise, the additional employees across categories would constitute less than 0.5 percent of the County's workforce, and the seasonals would comprise less than 0.4 percent. These percentages fall even lower when the additional employees are compared to the resident and workforce number anticipated when the new positions would actually come on line. Note that additional VA employees would probably not reside uniformly nor exclusively in the County, so these percentages should be used just to indicate the general magnitude of the impact.

Development Schedule

Another important consideration in assessment of the potential socioeconomic impacts of the proposed development is the scheduling of developments under each alternative. VA's projections for completion of each alternative, should authorization be granted, are:

Alternative A - No Action	3 years (outside of CAT III area)
Alternative B - Center Ridge	3 years
Alternative C - Proposed Action	5 years
Alternative D - MDP	7 years

Most direct and indirect socioeconomic impacts of the proposed development would be experienced within these time frames, and much of the following discussion is based on this schedule.

4.4.4.1.1 Employee Housing

Under the No Action Alternative, VA would add 55 people to its staff over a 3-year period. Of these, 17 would be full-time, year-round personnel or regular seasonals, the categories most likely to reside in the area. The remaining 38 employees would be primarily temporary seasonals in the pool of workers provided accommodation by VA or seeking scarce, seasonal accommodation elsewhere in the region.

Under the action alternatives, projected resident employee numbers would grow by 11, 16 and 20, respectively, for the Center Ridge Alternative, the Proposed Action, and the MDP Alternative. Temporary seasonal employee numbers would be 12, 55 and 55.

It should be noted that local residents might be recruited to fill new VA positions, but other workers would logically be needed to fill the vacated positions, ultimately resulting in similar demand for housing.

4.4.4.1.2 Community Services

Municipal Water Supply

The issue here is whether the water demands of additional off-peak skiers and VA employees would significantly impact the area's municipal water systems. Off-peak skiers' impact should be assessed in the context of the immediate Vail area where most visiting skiers stay. The area's current water supply has been deemed adequate, and that determination was based on the Vail area's bed base, not actual or projected skier numbers. Since the bed base exceeds the 19,900 SAOT manage-to limit, and since off-peak skiers are by definition accommodated under that limit, such skiers should have no impact on the adequacy of the water supply.

Additional VA employees complicate the issue somewhat, in that many would likely reside outside the immediate Vail area, and they probably were not specifically factored into the projections of population growth used by planners in calculating the adequacy of water supplies. However, as indicated in Chapter 3, water supplies and infrastructure in the Upper Eagle Valley Consolidated Sanitation District (UEVCSD) service area have been developed to meet projected needs through buildout well into the next century.

Potential impacts would be concentrated in, but not restricted to, the UEVCSD service area. In light of the small increments of population growth attributable to additional VA employees noted above under Employee Housing, the conclusion that municipal water supplies will remain adequate for the foreseeable future appears reasonable in light of the alternatives being considered here.

The impact of these alternatives would differ insignificantly, following the profile outlined above under Employee Housing.

Wastewater Treatment

The wastewater treatment situation parallels municipal water supply. Local governments and the UEVCSD have developed a consolidated program to meet anticipated demand in the service area through 2012. Again, more off-peak skiers would not impact this situation, and additional VA employees comprise an insignificant part of the anticipated growth in resident population. Overall, the impact of implementing any alternative under consideration on the adequacy of wastewater treatment would be negligible, and differences among the alternatives would be insignificant.

Solid Waste Disposal

The issue addressed here is whether the increased solid waste generated by increased off-peak skiers and additional VA employees would significantly affect the Eagle County landfill or the efforts of the local recycling organization. Unlike projections of municipal water use and required wastewater treatment, estimation of solid waste generation is not based on indirect measures such as bed base but on actual population and visitor numbers. Thus, both off-peak skiers and additional VA employees could impact the projected lifespan of the Eagle County landfill, currently estimated at 10 to 15 years.

As noted above under Direct and Indirect Impacts, a 1-percent increase in annual skier visits would equate to 15,000 skier days, the equivalent of 41 year-round residents, or less than 0.2 percent of the County's population. Additional VA employees under any alternative would comprise less than 0.1 percent of the County's population.

These small percentages would contribute in a minor way to using up remaining landfill. It is unlikely that implementation of any alternative being considered would alter the 10-to-15-year projected life of the landfill or hasten landfill expansion, which is already being planned. It is also unlikely that any alternative would impact efforts currently underway to expand the recycling program.

Regarding differences among alternatives, the No Action Alternative has the lowest potential to increase skier numbers and the lowest number of additional VA employees. Its impact would therefore be lowest. The impact of the action alternatives, though insignificant, would increase from the Center Ridge Alternative, through the Proposed Action, to the MDP Alternative.

Schools

The issue regarding schools is whether the additional school-aged children associated with growth in VA's staff would significantly impact schools of the Eagle River School District. As noted above under Direct and Indirect Impacts, most additional VA employees would be temporary seasonals and unlikely to have children in school. The total of regular seasonal and administrative employees, the categories more likely to involve families, would be 17 for the No Action Alternative, with an additional 11 for the Center Ridge Alternative, 16 for the Proposed Action, and 20 for the MDP Alternative. Again, these numbers represent less than 0.1 percent of the County's rapidly growing resident population.

The Eagle County school system is expanding rapidly and currently slated improvements should meet anticipated demand through 2005 (Chapter 3), these minor additions to the population should have negligible impact. Outside Eagle County, in communities such as Leadville, additional VA employees might have a greater impact on schools but, given the small number of families potentially involved, the impact would not be significant.

The same relationship among alternatives regarding their relative effects on community services outlined above would hold for schools.

Police, Fire and Emergency Medical Services

The issue here is whether emergency services in the Vail area would suffer significantly as a result of proposed increases in the number of off-peak skiers and VA employees. The picture that emerges when current conditions outlined in Chapter 3 are overlaid with projections of stable to moderate growth in resident and visitor numbers is that the larger communities in the upper and middle portions of the valley would have little difficulty maintaining high quality emergency services. Police, fire and emergency medical services are currently adequate, and planning and funding are generally in place to make up deficits as they are foreseen. The minor increments of population and skier growth projected under the alternatives considered here would not alter that conclusion.

In outlying Eagle County communities, such as Red Cliff and Gypsum, and communities outside the county, particularly Leadville, this scenario might change. These communities have fewer resources to expend on emergency services, and access to services in the larger communities is limited by distance. In these communities, even a small number of additional residents and visitors could have a noticeable effect on the level of emergency services. However, this impact should not be significant given the growth rates currently evident and the small increments potentially added as a result of the action alternatives.

The same relationship among alternatives regarding their relative effects on other community services outlined above would hold for schools.

4.4.4.1.3 Economic Considerations

The issue here relates to private and public costs and benefits associated with changes in off-peak skier numbers and the size of VA's staff. In the private economy, both skiers and resident employees spend money, supporting business, generating employment, and maintaining the economy. Skiers typically spend more than resident workers on a daily basis but are present for limited periods. In the public economy, both categories of people generate costs, in terms of community services, as well as tax revenues. With skiers, revenues generated tend to exceed costs, while costs and revenues tend to balance for residents.

The most important factor in this economic analysis is skier-related revenues, both private and public. Destination skiers currently spend an average of about \$190 per day in the Vail Valley, and day skiers spend about \$50 (Frick, *pers. comm.*, 1995). These figures encompass on- and off-mountain spending and include pertinent taxes. To build on the example of a 1-percent change in skier numbers introduced above, 15,000 destination skier visits would equate to \$2.85 million, while that number of day skier visits would yield \$750,000. Figure 4.27 illustrates how tax revenue could potentially increase as skier numbers increase under various growth rate assumptions for each of the alternatives being analyzed.

In terms of sales tax revenues, assuming all these expenditures were taxable, this amount of destination skier spending would generate \$228,000, with 4 percent to the TOV, 1 percent to Eagle County, and 3 percent to the State. For day skiers, the total revenue would be \$60,000. While the TOV's sales tax revenues totaled over \$10 million last year, these smaller, incremental amounts remain important.

Sales tax revenues of this magnitude support the community's economy and make the high costs of providing public services tolerable. On the local scene, in the immediate Vail area, this suggests that the most important potential impact to note is the damage to the private and public economies that would result from a substantial decrease in skier visitation. A decrease could occur under any alternative but would be more likely under the No Action Alternative. Such a downturn could have an effect. Implementation of an action alternative with a higher potential to maintain or increase skier numbers, should have a positive effect on the local economy.

The significance of the lower per-skier spending of day skiers also should be considered in assessing the down side of the No Action Alternative. Considerably more skiers would be required to maintain a given revenue stream if the balance of skier visitation were to shift away from destination skiers. Also, recent increases in sales and property tax rates warrant mention. As a result of these increases, options to increase revenues by this means may be limited.

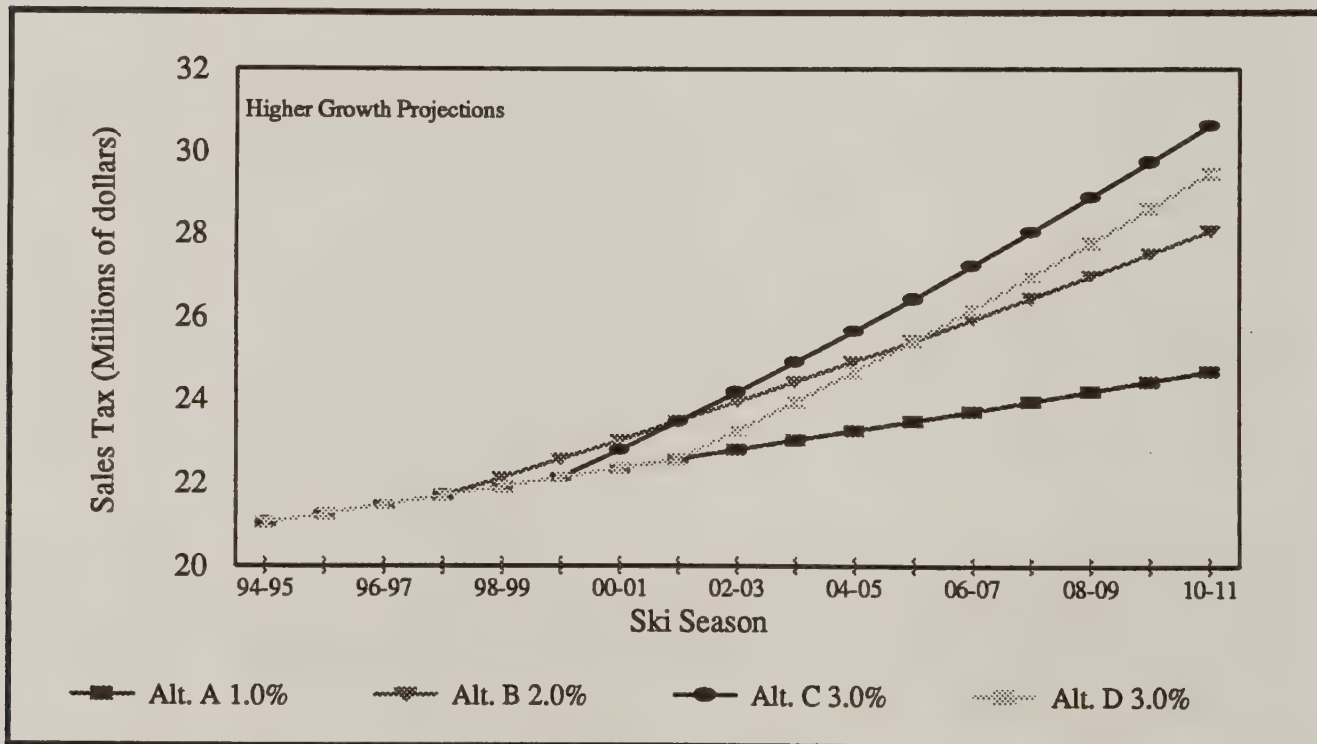
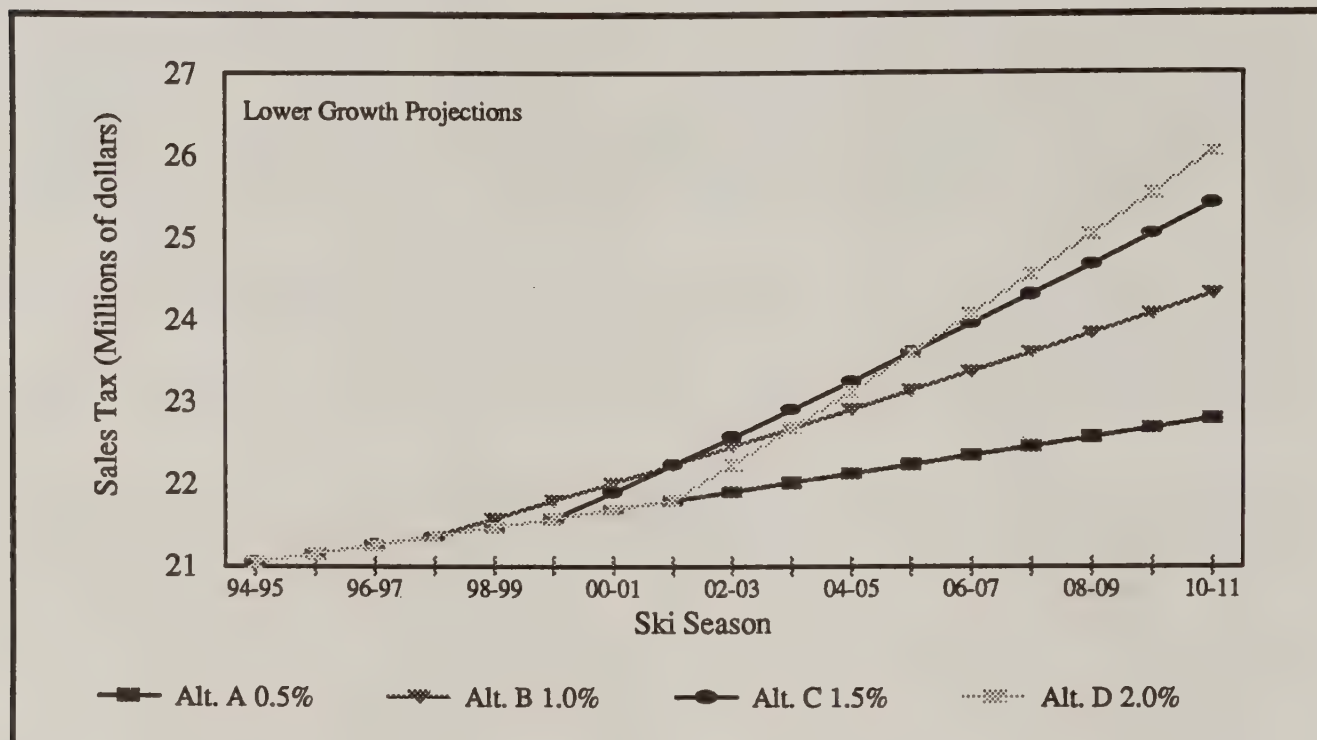


Figure 4.27. Extrapolations of tax revenues under high and low annual skier visitation assumptions for each alternative.

Moving away from the Vail core area, this situation could reverse. Communities such as Gypsum and Leadville, where additional VA employees might live, would bear the costs of providing community services without benefit of the high revenues associated with skier visitation. This situation is worsened by Amendment One. In addition, commuting employees might well do most of their shopping in the larger communities where they work. This would deprive local businesses and governments of even these relatively minor economic benefits. In short, the net economic consequences of ski area development in satellite communities might well be negative, but given the numbers of additional people involved and the rate of growth projected regardless of the development (Section 4.4.5.1) they should not be significant. A positive aspect is the stabilizing force of a relatively stable resort employment base in communities formerly dependent on mining or other less dependable industries.

In terms of the ski area's direct economic contribution, changing skier numbers would affect sales tax generation, contributions supporting mass transit with 4 percent of ticket sales, and payments to the federal treasury associated with the ski area's SUP, which during the past year was more than \$2.4 million (Vail and Beaver Creek ski areas combined). VA's purchase of any timber removed in the course of the development could generate substantial additional federal revenues. This is displayed in the Timber Resources section.

Regarding differences among alternatives, the No Action Alternative has the lowest potential to increase skier numbers and the lowest number of additional VA employees. Its impact would therefore be lowest. The impact of the action alternatives, though insignificant, would increase from the Center Ridge Alternative, through the Proposed Action, to the MDP Alternative.

4.4.4.1.4 Life Styles and Quality of Life

The characteristics which many feel are important in maintaining the quality of life in the Vail Valley were enumerated in Chapter 3. As was noted in that discussion, much of the potential impact to quality of life can be assessed by examining topics such as community services, employee housing, and schools, which are addressed above. Discussion of more subjective issues follows.

Many who have moved to Colorado's mountain communities have done so seeking an alternative to urban lifestyles, but rapid growth is diminishing the rural character of such communities, including the Vail Valley. Given population projections, this will likely become an issue of even greater concern in the future. While this distresses some, recent arrivals—especially those from cities—still find the area to be an extremely desirable place to reside and an escape from urban life.

Primarily through an increase in VA staff, who would be long-term residents, development of the CAT III area would add to this shift in the character of the area. However, the small increases in staff would represent a very minor impact in the context of the larger forces at work. While peak-day skier numbers will not increase, residents are likely to experience some effect from prolonged periods of higher visitation. For example, even though roads and streets can accommodate peak-day traffic volumes, motorists are likely to notice more frequent "busy" days. Similarly, residents who see the shoulder seasons as a respite may be disappointed with some aspects of increased off-peak growth in skier visitation, such as more frequent long waits in supermarket checkout lines and at retail stores.

The availability of a wide variety of outdoor recreation opportunities is important to many in the Vail Valley. With growth in both resident and visitor numbers alike, existing facilities such as hiking and biking trails, parks, campsites, and fishing areas are experiencing greater pressure. For many, increased use levels result in a diminution in the quality of the recreational experience. However, in view of other more powerful growth forces

at work on recreational use of the region, development of the CAT III area would not noticeably alter this situation. For some residents, the availability of new ski terrain, with good snow conditions and better distribution of skiers, would be a very positive addition to the recreation offerings in the area.

Rising living and real estate costs in the Vail Valley have made home ownership difficult for many residents and caused others to move to locations that require long commutes to places of employment. The stress of coping with this detracts from the quality of life for such residents. Again, however, the cost of living and its accompanying pressures are fueled by larger growth forces. The CAT III development would add, in a very minor way, to these pressures by introducing additional permanent employees into the area.

Unlike the TOV, some communities in the region have been in existence since early in the 1900s. Over this period, strong family, ethnic, and cultural ties have evolved in places like Minturn, Red Cliff, and Leadville. Changing employment opportunities, escalating real estate prices, and influxes of new residents have challenged these communities and their traditional lifestyles. This trend shows little sign of moderating. Development of the CAT III area would contribute to but this trend would be a minor factor.

Good schools, low crime rates, and the availability of cultural events also factor into lifestyle considerations. Due largely to the small number of additional employees generated and the wide geographic area involved, CAT III development would have little effect on schools or crime rates. It could be argued that the economic environment created by more balanced skier visitation could indirectly enable an even wider array of cultural opportunities to be offered or developed.

4.4.4.2 Potential Mitigation Measures

No mitigation beyond effort currently underway is suggested.

4.4.4.3 Unavoidable Adverse Impacts

Of the potential adverse socioeconomic impacts cited above, those resulting from additional VA employees seem the most unavoidable. These include adequate housing for all categories of employees and impacts on community services, local economies, and quality of life in the satellite communities where resident employees would likely reside. While such impacts are probably inevitable, they would be minor because of the few employees involved in relation to the growth anticipated in these communities with or without the CAT III area development.

4.4.4.4 Cumulative Impacts

The potential socioeconomic impacts of the development of the CAT III area must be assessed in the context of the region as a whole. The Vail region is subject to the same "boom in mountain living" as other West Slope mountain communities in Colorado and other popular mountain areas in the West. Other ski areas are slated for or have started development (e.g., Adam's Rib or expansion at Beaver Creek- Arrowhead). Summer recreation, often centered around new golf courses, constitutes the fastest growing economic sector. Second-home construction, much of it associated with ski areas or golf courses, is brisk. Telecommuting is also a growing factor in area development. New public and private infrastructure, with associated labor needs, is coming on line to support this development.

In this setting, resident, part-year resident, and tourist numbers are expanding rapidly. The socioeconomic impacts of this expanding population are basically the same as those addressed in this analysis. In light of the

relatively small number of people associated with the proposed CAT III development, their potential contribution to these impacts is small.

The question here is whether the proposed development of the CAT III area, when viewed in this larger context of development in the region, would result in some critical threshold being surpassed, causing a significant socioeconomic impact. While any conclusion in this regard is somewhat speculative, given the minor increment of added impact and the apparent ability of the communities involved to deal with such impacts, no significant impact is likely.

Additional information regarding recently completed, ongoing, and foreseeable future projects that could affect this resource is found in the introduction to this chapter.

4.4.5 TRANSPORTATION AND PARKING

This section builds on the discussion of transportation and parking in Chapter 3 to examine the impacts associated with the Proposed Action and alternatives to it. Because direct and indirect impacts on traffic and parking are similar under all alternatives, this section describes common impacts due to increases in employees, visitors, and residents, rather than discussing impacts separately by alternative. Transportation impacts which could result from efforts to commercially utilize timber cleared for ski trails are described in the Timber Resources section.

4.4.5.1 Direct and Indirect Impacts

Non-peak transportation and parking impacts could result from increased vehicular traffic and demand for parking due to increased numbers of visitors, residents, and employees. Of these three factors only the increased number of employees can be accurately estimated. Over the long-term, the numbers of visitors per year and of residents in the Vail area have been increasing. The impacts of the alternatives on this rate of increase are difficult to determine and will be strongly influenced by factors not directly related to the alternatives, such as the national economy, overall skier market, marketing activities at Vail, and marketing activities and developments at other ski resorts.

None of the alternatives will modify the 19,900 SAOT manage-to capacity which has been established (USDA-FS 1986a). Therefore, no substantial increases in skier numbers are expected to occur during the peak and high use periods of Christmas, the Presidents' Day holiday, or spring break holiday. The increased skier visits during the early and late season shoulder periods, during midweek days and other non-high demand periods is anticipated, but is difficult to estimate. Therefore, the discussion that follows is based on some reasonable estimates of employee increases, and assumptions about increases in visitors and residents.

The number of employees would increase somewhat under all alternatives. A total of 55 permanent or seasonal employees will be added to VA staff under the No Action Alternative in conjunction with future improvements planned for other facilities in the CAT I and CAT II areas. An additional 23, 71, and 75 employees would be required under the Center Ridge Bowl, Proposed Action, and MDP alternatives, respectively. A recent survey of Eagle County residents (Richman 1994) showed that 80 percent use their personal vehicles to get to work. Using this percentage, the above projected employee increases would result in an additional 44, 62, 101, and 104 vehicles in Vail under the No Action, Center Ridge, Proposed Action, and MDP alternatives, respectively. Given

the well developed public mass transit system serving the Vail community, and the success of the down valley route, these numbers are probably high.

Since 1983 the number of annual skier days at Vail has increased at about 2 percent per year and is currently about 1.5 million skier days. At 1.5 million, a 2 percent increase is about 30,000 skier days. When spread over the course of an average 142-day ski season, this gives an average daily increase of about 215 skier days per day. It is difficult to make projections on how this increase might impact traffic and parking in Vail. The increase in skier days could come from more skiers visiting Vail during non-peak periods, which would increase traffic and parking demand, or it could come from the current number of skiers staying longer, which would have less impact on traffic and parking demand. The increase could come from more day skiers, which would increase traffic and parking demand, or it could come from more destination skiers, who, because many of them use airport van services, would have less impact on traffic and parking. Though the action alternatives are expected to increase the number of destination skiers, their impact on parking and transportation would be less than the numbers might indicate. This is because some of the increase would likely come from longer stays and most of the increase would occur during non-peak periods. Under the No Action Alternative, it would be more difficult to maintain the current rate of growth in skier days. What growth would occur is expected to come primarily from day skiers, who have the greatest impact on traffic and parking demand.

Growth and development in the Vail area continues at a rapid pace. Any increase to the number of residents and related impacts to parking and transportation resulting from any of the alternatives would be negligible in comparison to the larger forces affecting growth in and around Vail.

The 1986 EA/DN judged traffic and parking to be acceptable with the 19,900 SAOT manage-to program in place. Since that time, notable efforts have been made to improve traffic and parking, the new roundabouts being prime examples. The increased off-peak visitation anticipated under the proposed CAT III development should not negatively affect this situation. Additionally, building skier visitation during non-peak periods would make more efficient use of the mass transit system and public parking facilities.

4.4.5.2 Cumulative Impacts

There would not be any appreciable difference between the cumulative impact of any of the action alternatives associated with this EIS because they all would contribute marginally if at all to traffic and parking impacts. Below is a discussion of the combined effects of past, present and reasonably foreseeable actions affecting transportation and parking in the Vail area.

The past effects include recognition that both traffic flow and parking were primary impacts recognized and addressed in the 1986 EA/DN. Many of the recommended and required mitigation measures from that document were steps to improve and upgrade transportation in the Vail area. Those measures have been enacted, and together with a community commitment to aggressively manage parking, traffic flow, and mass transit, the effects of peak periods is generally dealt with successfully. In particular, parking management and the initiation of a successful mass transit system have generally resolved the substantial impacts identified in 1986. Since 1986, approximately 463 parking spaces have been added to the main public parking structures and facilities in the TOV; and during the 1994/95 ski season, the two primary parking structures in the TOV were not ever simultaneously filled (Grafel, *pers. comm.*, 1995).

Presently, the TOV is implementing actions to improve traffic flow and enhance parking. The new traffic roundabout at the main intersection in Vail, should virtually eliminate a major traffic choke point. Furthermore,

the TOV is evaluating traffic congestion at the second largest intersection, in West Vail, and considering placing a traffic roundabout there as well. The TOV continues to make provision of adequate parking a condition of approvals to build lodging and other commercial structures which should promote at least "adequate" availability of parking. The TOV, VA, Eagle County and others continue to support an area mass transit system reducing private vehicle use. The recent signing of the Agreement to Manage Peak Periods (see Appendix A) by the TOV and VA further formalizes the commitment to improve area transportation and other related systems. A more detailed discussion of the present situation can be found in the transportation and parking section of Chapter 3.

Reasonably foreseeable future actions which could affect transportation and parking include continued population growth of the Vail area as projected by local and county planners, and more aggressive promotion of year-round recreation in the Vail area. Impacts of summer events that draw large crowds to the Vail area would be offset by building a transportation system adequate to cope with peak skiing demand, provided that the TOV and event sponsors are willing to support the system. Vail is rapidly approaching full buildout, and the availability of land for development is decreasing correspondingly. The remaining margin for improvement of traffic and parking in Vail, is probably limited to refinements of systems and programs already in place. These, however, appear adequate, given no substantial increase in peak-day visitation.

4.4.6 VISUAL RESOURCES

As noted in the Visual Resources Section of Chapter 3, the direction for management of visual resources is guided by the Forest Plan and the Forest Service Visual Management System (VMS), which establishes acceptable levels of alteration of the landscape due to development. An explanation of the VMS system is found in Chapter 3. The visual quality objective (VQO) for Vail Ski Area, including the CAT III area is *modification* and all alternatives would be consistent with this VQO. A summary of potential impacts to visual resources is provided below. The analysis is centered on viewpoints identified during scoping.

The natural terrain configuration of the CAT III area tends to reduce visual impacts. In particular, the PA consists of three major bowls (Commando, Pete's, and Super) and four bowls of lesser extent (East Pete's, Super Bowl West, lower Sun Down, and Tea Cup) divided by relatively sharp intervening ridge lines. In addition, the northerly orientation of most of the bowls and the CAT III area's location in a generally closed drainage basin (Two Elk Creek) are also important factors in potential impacts to visual resources. Finally, it should be noted that the CAT III area is not visible from any towns, residences, or highways.

4.4.6.1 Direct and Indirect Impacts

4.4.6.1.1 Alternative A - No Action

Under the No Action Alternative, visual resources would remain as they are today in the PA, a matrix of dense coniferous forest, interspersed with several blocks of naturally open meadows and naturally gladed forested slopes. Views from along the ridgeline of Vail Mountain, Sleepytime Road, adjacent wildernesses, and Commando Run and Two Elk Trails would be unaffected.

4.4.6.1.2 Alternative B - Center Ridge

Under this alternative, development would be focused in Super Bowl, the lower-lying Center Ridge area, and in Tea Cup Bowl. In addition, a road and skiway system would also be constructed, much of it paralleling Two Elk Creek. Two lift terminals and two bridges would be located in this corridor.

From the Holy Cross Wilderness, all points from which the developed area in the Center Ridge Alternative might be seen would be background views, making it very difficult for the viewer to discern individual facilities or even the project itself. Due to topography and distance, it is unlikely that any development associated with this alternative would be visible from the Eagles Nest Wilderness. Views of the existing front side of the ski area would be more apparent, though at distance of over 5 miles.

Ski trails and the Center Ridge Lift line would be most visible from western portions of the ridgeline of Vail Mountain, such as the Wildwood Restaurant, the upper terminal areas of Lifts 4, 5, 11, and 17, and several sections of Sleepytime Road. Moving eastward, views along the ridgeline such as at Two Elk Restaurant, the upper terminal of Lift 21, and upper Siberia and Mongolia bowls would be increasingly obscured or blocked, due mainly to distance and intervening ridges. However, a few ski trails in the eastern Center Ridge area and in western Pete's Bowl could be visible from upper Mongolia Bowl at a distance of approximately two miles.

Views from Commando Run Trail would be largely unaffected by implementation of Alternative B. That section of the trail extending along the southeastern portion of the CAT III area to Two Elk Pass is located in dense, spruce-fir forest, with few opportunities for westerly viewpoints and several intervening ridges. However, upper portions of several ski trails in western Pete's Bowl and the eastern Center Ridge area could be visible from that portion of the Commando Run Trail near the top of Mongolia Bowl. Potential visual impacts for users of the Two Elk Trail would occur mainly along that section of the trail beginning at the current base terminal of Lift 21 and extending west to the confluence of Two Elk Creek and lower Tea Cup Bowl. In this corridor, two bridges, the Intertie Skiway, the Tea Cup Skiway/Road, two base terminals, and the lower portions of trails in the Center Ridge area would be clearly visible in the foreground. Upper sections of Center Ridge and all of the Super Bowl developments would not be visible from within the Two Elk Trail corridor because of topography.

4.4.6.1.3 Alternative C - Proposed Action

Under this alternative, development would occur primarily in Pete's, East Pete's, Super, and Tea Cup bowls and the Center Ridge area. The primary difference in comparing the Proposed Action to Alternative B is the extension of ski facilities into the main part of Pete's and East Pete's bowls, construction of a restaurant just east of the confluence of Two Elk Creek and Pete's Bowl drainage, and a bridge associated with the restaurant. In the Center Ridge area and in Super Bowl, development and associated impacts to visual resources would be nearly identical to that described above for Alternative B. The discussion which follows focuses on the additional impacts associated with implementation of this alternative compared to Alternative B.

In comparing the Proposed Action to the Center Ridge Alternative, there would be little or no difference in potential impacts to visual resources when viewing the PA from the Holy Cross Wilderness. This is due primarily to intervening topography and the orientation (i.e., north-facing) of the CAT III bowls. Compared to Alternative B, there would also be little difference in visual impacts in the PA as seen from the Eagles Nest Wilderness. Any possible view of CAT III area developments (primarily in upper Pete's and East Pete's bowls) would be provided only from very high points in the Eagles Nest Wilderness and at a distance of over 10 miles.

Under the Proposed Action, ski trails and the Center Ridge Lift line would be clearly visible from several sections of Sleepytime Road and from the ridge line of Vail Mountain beginning at the Wildwood Restaurant and extending east to the upper terminal of Lift 21. Moving further east to upper Siberia and Mongolia bowls, views of CAT III area developments would be increasingly obscured or blocked, due mainly to distance and intervening ridges, though some ski trails in East Pete's Bowl, the eastern Center Ridge area, and the western portion of Pete's Bowl may be visible at a distance of about two miles.

Potential impacts to views from the Commando Run Trail would be very similar to the Center Ridge Alternative. The major difference among these alternatives is that those ski trails in upper East Pete's and lower Pete's Bowl may be visible from near the top of Mongolia Bowl. The zone of potential visual impacts for users of the Two Elk Trail would be extended somewhat compared to Alternative B. The primary aspect of this would be construction of a bridge and associated restaurant along Two Elk Creek (Map 15). Both facilities would be in close proximity to the Two Elk Trail. In addition, from this same point west to the base of Lift 21, ski trails on the lower portion Pete's Bowl would also be clearly visible in the foreground, though little of the main part of Pete's Bowl and its developments could be seen. Views of upper sections of Center Ridge and all of the Super Bowl developments would not be possible from within the Two Elk Trail corridor because of topography.

4.4.6.1.4 Alternative D - MDP Alternative

Within much of the PA, this alternative is nearly identical to the Proposed Action. However, the MDP Alternative involves development of ski facilities and a temporary timber haul road outside of the area affected under the Proposed Action. In particular, implementation of this alternative would extend ski trail development into Commando Bowl, Super Bowl West, and the Lower Sundown areas. The potential impacts presented are based on a comparison to the Proposed Action - Alternative C.

There would be no difference in effects between this alternative and the Proposed Action in terms of possible impacts associated with views from adjacent wilderness.

Under the MDP Alternative, ski trails and several lift lines would be clearly visible from several sections of Sleepytime Road and from the ridge line of Vail Mountain, beginning at the Wildwood Restaurant and extending east through upper Mongolia Bowl. In addition to developments described under the Proposed Action, ski trails and/or lift lines would be visible in Commando Bowl and the upper section West Super Bowl.

The dense, forested vegetation along the Commando Run Trail extending south from Two Elk Pass would tend to mostly obscure the visual presence of ski trails in Commando Bowl under this alternative even though the two would be in close proximity. On the other hand, Commando Bowl developments would be quite visible from that portion of Commando Run Trail extending north through Mongolia Bowl. The MDP alternative would extend the visual presence of ski area developments along the Two Elk Trail approximately one mile to both the east and west of what would occur under the Proposed Action. From the restaurant bridge east about one mile, trail users would be able to see development in lower sections of Commando Bowl. Between the confluence of Two Elk Creek and Tea Cup Bowl, west about one mile to the Lower Sun Down area at Two Elk Creek, two base terminals, sections of the West Super Bowl Road and Skiway, lower portions of ski trails in the Super Bowl West area would all be visible in the foreground. Due to topography, most developments in Lower Sun Down Bowl would not be visible from the Two Elk Trail.

The temporary timber haul road associated with this alternative would likely create some additional impacts to visual resources. This road would extend about 1.3 miles from the current Lime Creek road system north, to

Commando Saddle. A short section of this road could be seen along a 0.5-mile section of Lime Creek Road (FS 728) as it extends through several areas of past timber harvest. The VQO of modification would also be met under Alternative D.

4.4.6.2 Potential Mitigation Measures

A discussion of standard mitigation measures and potential mitigation measures that are project specific for each resource are discussed in Chapter 2. Table 2.11 summarizes the major measures noting their effectiveness and the organizations responsible for authorizing and implementing them.

Steps that can be taken to mitigate the adverse impacts to visual resources include:

- ◆ As much as possible, avoiding linear openings in forested vegetation by feathering the edge of ski trails.
- ◆ Locating lift lines in natural openings.
- ◆ Designing cleared ski trails to coincide with lift alignments.
- ◆ Adhering to standard practices already in place for exterior facility design, colors, and placement and revegetation practices.

4.4.6.3 Unavoidable Adverse Impacts

Impacts to visual resources associated with development of the CAT III area are largely unavoidable.

4.4.6.4 Cumulative Impacts

There are no past activities within the CAT III area which would add to the project's cumulative effects. In the Back Bowls a limited number of facilities are already in place which could interact in a cumulative fashion. These include Lifts 5, 17, 21, and 22 and several miles of road and skiway extending through Sun Down, Sun Up, Tea Cup, and China bowls. In addition, several structures, food service facilities, and surface lifts are located along the ridge line of the Back Bowls and the front side of the ski area. All of these are depicted on Map 1.

A realignment and upgrade of Lift 22 has been approved and will likely be constructed in the future. To some degree this project would affect visual resources, primarily for users of the Commando Run and upper Two Elk Trails. Through that portion of the Commando Run Trail that extends through upper Mongolia Bowl, Lift 22 would be visible. A new base terminal for Lift 22 would be located along the Two Elk Trail. It would be visible to users in either direction for several hundred yards.

4.4.7 TIMBER RESOURCES

This section summarizes the various timber harvest methods and haul route options identified in Chapter 2 and provides an estimate of the volume of commercial timber which could be made available and the associated revenue which could be generated under each of the alternatives. In addition, this section discloses the incremental effects to the various resources which could be associated with timber harvest and utilization efforts. The reader should note that Air Quality is one exception to this format. Because of its complexity, incremental

air quality impacts are treated in total in the Air Quality section of this chapter. Finally, potential mitigation measures are listed which could offer means to minimize or avoid adverse impacts associated with timber harvest and hauling.

The analysis presented in this section does not include an economic analysis of the various timber harvest and hauling options. It should be noted that Harvest Method 3 and Haul Option 3 are not widely used in timber harvest operations in Colorado, in part because of cost. This analysis focuses on the potential impacts to the physical, biological, and human environment. Any harvest and haul conditions which might be placed on implementation of this project would entail a later economic analysis.

4.4.7.1 Summary of the Timber Harvest and Disposal Methods

Chapter 2 includes a detailed discussion of the possible timber harvest, disposal, and hauling approaches which could be used in the CAT III area. They are also summarized below.

Harvest Methods

Method 1 - This method would utilize conventional ground-based skidding. VA would be required to pay for all merchantable material that would be cut on slopes less than 40 percent and within 1,000 feet of a road or skiway. All timber would be disposed of on site either by burning or by being used in the construction of ski or ancillary facilities.

Method 2 - Harvest would be the same as above except that all timber cut on slopes less than 40 percent and within 1,000 feet of a road or skiway would be removed for commercial use, rather than burned.

Method 3 - Harvest would be by use of several methods designed to optimize commercial utilization. This could involve cable (skyline), log forwarding and feller-buncher, and helicopter yarding systems or equipment. The permittee would be required to pay for all merchantable material removed from the area and the timber would be used commercially.

Haul Options

Option 1 - Timber would be hauled from the CAT III area, through the Back Bowls, and down the front side on the existing road system. This would involve use of the Transmontane/Mill Creek route and enter I-70 via Vail Road. The route is shown in Figure 4.28.

Option 2 - This haul route is discussed in detail as a component of Alternative D - MDP Alternative. It involves construction of about 1.3 miles of temporary road, which would link the CAT III area with the Vail Pass/Shrine Pass Road system via Lime Creek. This route is illustrated in Figure 4.28.

Option 3 - This option would involve helicopter transport of logs from the CAT III area to one of several locations. Logs removed from the CAT III area would be air-lifted to a staging area on the existing Lime Creek or Timber Creek roads, or the Two Elk Trailhead near Minturn.

4.4.7.2 Timber Outputs

Table 4.14 below summarizes the results of each combination of harvest method and alternative. The estimated stumpage (amount of money the permittee would be required to pay for the timber) is determined not only by Forest Service merchantability standards, but also by the logging costs. Timber volumes shown are expressed in million board-feet (mmbf). The stumpage value shown assumes that Hauling Option 1 is selected.

The amount of commercial timber potentially made available is generally a function of the amount of ski trail clearing in each of the alternatives. As is shown, using more sophisticated logging methods makes substantially more timber available for commercial use in each of the action alternatives. Approximately 80 to 90 percent of the volume of timber shown which would be cut would meet sawlog standards, while the remainder would be smaller diameter material that would qualify as products other than logs.

Table 4.14. Timber Outputs by Alternative and Harvest Method				
<i>Alternative</i>	<i>Harvest Method</i>	<i>Volume Cut (MMBF)</i>	<i>Volume Removed (MMBF)</i>	<i>Stumpage Value</i>
No Action	1,2,3	0	0	0
Center Ridge	1	4.96	0	\$99,881
Center Ridge	2	4.96	.90	\$469,406
Center Ridge	3	4.96	4.57	\$250,492
Proposed Action	1	7.01	0	\$229,066
Proposed Action	2	7.01	2.12	\$238,115
Proposed Action	3	7.01	6.71	\$418,370
MDP	1	12.97	0	\$473,871
MDP	2	12.97	2.21	\$1,156,881
MDP	3	12.97	12.26	\$648,615*
*Potential revenue is reduced due to higher logging costs inherent in this alternative				

4.4.7.3 Impacts to the Physical Environment

Harvest Method 1

This method is the one most frequently used in current trail clearing projects on Vail Mountain. Consequently, the impact assessment for geologic, soil, and water resources found in Chapter 4 assumes these techniques would be used and no additional impacts are foreseen under this method.

Harvest Method 2

Though the location of skid trails would change somewhat, the general level and intensity of impacts to geology, soil, and water resources would remain essentially the same as under Harvest Method 1. As well, there would be no difference with respect to noise related to the project, compared to Harvest Method 1.

Harvest Method 3

The logging systems and methods which would be employed under this method would greatly reduce the amount of ground disturbance. Consequently, impacts to geology, soil, and water resources would be substantially reduced compared to other harvest methods. While cable yarding and feller-buncher operations would not change potential noise impacts, helicopter yarding operations would noticeably increase noise levels in the PA compared to other techniques. However, because of its efficiency, helicopter yarding would span a much shorter period of time.

Haul Option 1

This option would utilize roads and skiways that would be built for the CAT III area ski facilities, existing roads within the Back Bowls, and those on the front side of Vail Ski Area to remove merchantable timber. Because of this, additional impacts to slope stability, soil erosion, or water quality would be minimal. However, noise associated with logging truck traffic would present some concerns. The total number of logging truck trips which would be required to remove merchantable timber with Harvest Option 2 is as follows: 1) No Action Alternative- none, 2) Center Ridge Alternative- 90 trips, 3) Proposed Action - 212 trips, and 4) MDP Alternative- 221 trips.

The number of trips would be spread over a 3- to 7-year period, so accordingly, annual truck trips would range from 30 to 40.

While the engines of trucks are not typically the source of loud noise, application of brakes with full loads traveling downhill can reach several decibels. The effect of noise on recreationists and residents in the TOV is described below in the section on Impacts to the Human Environment.

Haul Option 2

Potential impacts associated with hauling to Lime Creek Road are described under Alternative D - MDP Alternative for each of the disciplines.

Haul Option 3

There would be no incremental impacts to physical resources associated with this option. Using a helicopter, logs would be flown to a central staging area along an existing road. From there, they would be loaded on trucks for transport to a saw mill.

4.4.7.4 Impacts to the Biologic Environment

Harvest Method 1

The potential impacts to wildlife, vegetation, wetlands, and biodiversity are analyzed in the context of each of the alternatives in this chapter in the appropriate disciplines. No additional impacts are identified here.

Harvest Method 2

Since this method simply involves removal of the timber from the area, versus burning it on site, there would be no perceptible difference in impacts to wildlife, biodiversity, vegetation, wetlands, and aquatic resources compared to Harvest Method 1.

Harvest Method 3

All of these more advanced logging systems would disturb less ground vegetation than conventional systems. Cable logging systems would not vary measurably in the type and intensity of impacts to the biologic environment compared to other harvest techniques. Feller-buncher operations would tend to leave a mat of slash, which would create more favorable habitat for small mammals than conditions associated with conventional skidding. Helicopter yarding, while reducing ground disturbance, could extend the zone of disturbance because of increased noise. However, because of its efficiency, its period of operation could be shorter.

Haul Option 1

Considering the already high level of human and vehicular use on the front side of the ski area, impacts to wildlife from Haul Option 1 would be negligible. Since no additional land or vegetation would be converted to roadway, there would be no incremental impacts to biodiversity, vegetation, or aquatic life.

Haul Option 2

Potential impacts associated with this haul option are described for each discipline under Alternative D - MDP Alternative in discussion relating to the Lime Creek Road. The construction and use of a road to the Lime Creek drainage from the CAT III area would be an important concern for wildlife because of the potential to increase human access and hence disturbance (see the Wildlife section).

Haul Option 3

This method of timber transport would tend to have little or no incremental effect on vegetation or aquatic resources. From the point of view of reducing habitat fragmentation, eliminating the need for a Lime Creek timber haul road would be beneficial. There could be some, minor disturbances to wildlife resulting from increased helicopter use in the area during construction, but this would tend to be of shorter duration than other haul options.

4.4.7.5 Impacts to the Human Environment

Harvest Methods 1 and 2

Impacts to the human environment resulting from the timber harvest methods are encompassed within the various disciplines in this chapter. There would be no significant difference in potential impacts between implementing Harvest Method 1 or 2.

Harvest Method 3

Though not to the same extent as in Harvest Method 3, helicopter yarding would detract somewhat from the quality of the recreation experience for hikers and mountain bikers on Two Elk and the Commando Run trails. As long as operations were restricted to July and August, helicopter yarding would not seriously affect big game hunting opportunities in the area. The impact of other logging systems, such as log forwarding and skyline, would differ little with other harvest methods in the way in which it would affect the human environment in the area.

Haul Option 1

Impacts to the human environment would arise from truck traffic itself and the associated noise. Although the route identified (Figure 3.8) is a designated truck route for ski area maintenance and operations, it is also used by many hikers and mountain bike enthusiasts. It is likely that some recreationists would find additional traffic objectionable and choose to travel on the more westerly route to the summit of Vail Mountain, or may simply opt to recreate elsewhere.

Similarly, residents along Vail Road may find the increased truck traffic and noise from hauling logs unpleasant. The fact that various village construction projects have been in progress for several years has created somewhat of a "construction zone" in some areas and may add to the frustration of some residents and merchants.

Haul Option 2

The impacts to the recreation and land use which would be associated with development of a temporary Lime Creek haul route are included in the discussion of Alternative D -MDP Alternative.

Haul Option 3

Air transport of logs would create disruptions for summer visitors in and around the PA under this option. Both the Two Elk and Commando Run Trail receive at least moderate levels of use from July through September each year. Helicopter traffic would detract from the quality of the recreation experience for hikers and mountain bikers in the area. Some periodic closures of trails along the flight path may be required for safety purposes. Of the three potential staging areas and routes, flying the logs to the Two Elk Trailhead probably presents the greatest level of impacts to recreationists because the route so closely follows the trail itself. Conversely, an air route from the CAT III area to a Lime Creek staging area likely presents the fewest recreation conflicts.

4.4.7.6 Mitigation

- ◆ Restrict times and seasons of hauling in order to minimize impacts to residents and recreationists.
- ◆ If Haul Option 2 were selected, close the temporary road with a gate while operations are ongoing. When hauling is complete, obliterate, recontour, and revegetate the road prism and "jack-straw" with timber and slash to discourage use.

4.4.7.7 Unavoidable Adverse Impacts

The main unavoidable consequence of harvesting the timber is that the various vegetation types will be converted from forested to non-forested for as long as the area is maintained in a cleared condition. The functions and values of the forested vegetation types will be unavoidably lost for this period. More detail on how this type conversion would affect a particular resource such as wildlife or wetlands is found in the discussions of impacts in those disciplines. From a timber standpoint, timber production on the PA site would be unavoidably lost during the time that the area is maintained in a non-forested vegetative state.

4.4.7.8 Cumulative Effects

This section addresses cumulative effects only as they relate to the timber resource. In other disciplines, the combined effects of timber harvest, together with the impacts of past, present, and reasonably foreseeable future actions is included.

The lands within the Vail Ski Area SUP boundary are included in the suitable timber base for the White River National Forest and consequently are factored into the allowable sale quantity (ASQ). Because of that, any commercial timber which is made available from the CAT III area would reduce the amount of timber which might be offered for sale, or cut, on some other portion of the White River National Forest over the long-term.

In recent years, the Holy Cross Ranger District timber management program has included offering about five to six timber sales annually. In any given year, timber harvest activity varies widely. However, over a long-term average, about 1,000 acres of some type of timber harvest amounts to about 6 mmbf of timber being produced each year. The silvicultural treatment applied is usually an even-age system (e.g., clearcut or shelterwood). However, in some cases, group selection is a more appropriate regeneration method and is frequently used. Of the acreage treated, some areas are undergoing the last step of a shelterwood cut, meaning that the basic road system is mostly in place and that harvest will be occurring in roughly the same locations as before.

No new timber sales are currently planned within the LA. A potential sale was considered in the Timber Creek drainage previously, but was withdrawn because of potential combined impacts of timber harvest, together with future ski area development in the CAT III area. As previously considered, it would have included about 426 acres of spruce-fir shelterwood harvest. However, future timber harvest could be considered in this area depending upon the outcome of this EIS and economic and environmental considerations at that time. The Lime Creek Timber Sale is in its final season of operation and involves the last shelterwood entry over an area-year of about 500 acres. To the south of the PA, several other timber sales are either on-going or planned. These include the Hank's Gulch Timber Sale and the Wearyman Timber Sale. The Hank's Gulch Timber Sale is in its last season of operation and involves the final shelterwood cut of over about 350 acres. The planned Wearyman Timber Sale involves harvest over about 500 acres, primarily using a shelterwood system.

4.5 MITIGATION MEASURES

A full discussion on mitigation is found within each discipline section wherever applicable. A description of what is included in the Standard Mitigation Measures and project-specific mitigation measures is found in Chapter 2 and is summarized in Table 2.11.

4.6 THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES AND THE MAINTENANCE OF LONG-TERM PRODUCTIVITY

Short-term effects, both beneficial and adverse, of the alternatives have been identified by resource in the preceding sections of this chapter. This section discloses the implications of those effects with regard to the long-term stability and productivity of the environment in the Vail Ski Area SUP.

Vail Ski Area has been committed to management of a ski area since the issuance of its first SUP in 1962. This use has included the progressive development of Vail Mountain under provisions of Forest Service policy, standards and guidelines, including Forest Service acceptance of a ski area Master Development Plan and appropriate environmental and NEPA analysis. The 1B Winter Sports Management Area Prescription assigned to the Vail Ski Area SUP accommodates a high level of recreational visits on a relatively small portion of the Forest, and is consistent with the Forest Plan objectives for recreation. Further development of the ski area under any of the alternatives would create more recreational opportunities at Vail, and thus continue the commitment of the area to relatively high-density winter recreational use.

As discussed in this chapter, there would be a potential for direct, indirect, and cumulative effects on several resources, especially those associated with disturbance from construction activities. Many effects such as noise from construction and logging activities, and air quality impacts from slash burning would be seasonal and short-term. These effects while important, would be more-or-less temporary and transient due to their duration, intensity and the specific mitigation proposed to reduce impacts. Losses of long-term productivity would be expected to be mitigated by measures inherent in the proposal and standard guidelines and procedures, as well as specific measures formulated to minimize remaining impacts. None-the-less it is probable that implementation of any of the alternatives would result in long-term losses of productivity due to direct, indirect and cumulative effects on soil and vegetation.

Other long-term losses would include soil productivity where facilities were placed, loss and fragmentation of wildlife habitats (especially old-growth timber), and some impacts to groundwater and downstream water resources. The visual and recreational character of the area would be altered by the presence of ski facilities, and long-term use of the PA could increase due to the new roads and trails which could facilitate public access for hiking, biking, hunting and other recreation.

Long-term, significantly more land would be dedicated to alpine skiing within the SUP, which would in turn increase both revenues to the U.S. Treasury and add to the tax base the Vail area and contribute to the economic viability of Eagle County.

4.7 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

An irreversible commitment of a resource is one which cannot be changed once it occurs, and thus represents a loss of future options. It applies primarily to the use of a nonrenewable resource such as minerals or cultural resources, or to those factors or functional values such as soil productivity that are renewable only over long periods of time. Irretrievable commitment applies to a loss of production, harvest, or use of natural resources.

For example, while ski areas may produce some commercial timber through ski trail clearing and other projects, the area is not one in which timber production is a primary objective. Consequently, some loss of timber production potential over time is irretrievable.

The granting of a SUP to VA represents a long-term Forest Service commitment to use the area for winter recreation, specifically alpine skiing. The development of the CAT III area would be an extension of that commitment. Inherent in the development process would be the irretrievable loss of some renewable resources such as timber, certain wildlife and at least a portion of the "natural" undeveloped character of the CAT III area. However, using the area for recreation is not necessarily an irreversible commitment because the land management emphasis could eventually be changed.

Implementation of any of the alternatives, including No Action would continue, and/or accelerate the irreversible and irretrievable commitment of resources within the SUP, because that is a consequence of any development or use of natural resources. The magnitude of these types of commitments would roughly correlate to the size of the land area, and actual level of disturbance caused by development. The potential irreversible commitments associated with the alternatives include:

- ◆ reduction of certain function values (including heritage values) due to development within and/or adjacent to wetland and riparian areas;
- ◆ loss of topsoil resulting from exposure to accelerating erosion;
- ◆ reduction of biodiversity on a landscape scale including species and structural diversity and rare and special habitats; and
- ◆ loss of old-growth/spruce-fir timber and associated habitats for several generations.

Potential irretrievable commitments associated with the alternatives include:

- ◆ reduction of aesthetic experience, including backcountry (i.e., semi-primitive, non-motorized) recreation opportunities, due to change from roadless and undeveloped areas; and
- ◆ conversion of some habitats and subsequent displacement of some wildlife species for the life of the ski area.

4.8 SPECIFICALLY REQUIRED DISCLOSURES

4.8.1 EFFECTS OF ALTERNATIVES ON THREATENED OR ENDANGERED SPECIES AND CRITICAL HABITAT

There would be no adverse impacts to any federally listed threatened or endangered species, or critical habitat as defined by the Endangered Species Act as the result of this project.

4.8.2 EFFECTS OF ALTERNATIVES ON PRIME FARMLAND, RANGELAND, AND FORESTLAND

All alternatives in this EIS are consistent with the intent of the Secretary of Agriculture Memorandum 1827 for prime land. The project does not include any use of prime farmland or rangelands and the term "prime forest land" does not apply to the NFS lands. Under all alternatives, NFS lands would be managed with sensitivity to the effects on adjacent lands.

4.8.3 ENERGY REQUIREMENTS OF ALTERNATIVES

None of the alternatives would include unusual energy requirements beyond those normally associated with ski area development.

4.8.4 EFFECTS OF ALTERNATIVES ON MINORITIES AND WOMEN

There would be no discernable effects from any of the alternatives on Native Americans, women, or other minorities, and no alternative would impact the civil rights of any American citizen.

4.8.5 EFFECTS ON WETLANDS AND FLOODPLAINS

Effects, mitigation and protection of wetlands and riparian areas are described in the Wetlands Section of this document. The ACOE is a cooperating agency in this EIS and required permits and approvals will be obtained as a condition of any Forest Service approvals.

4.8.6 COMPLIANCE WITH SECTION 504 OF THE VOCATION REHABILITATION ACT AND THE AMERICANS WITH DISABILITIES ACT (ADA)

The permittee will be required to comply with all applicable provisions of Section 504 of the ADA. Compliance will be monitored through review of construction and annual operating plans.

CHAPTER 5.0 LIST OF PREPARERS

This chapter lists all people in the Forest Service and private sector who were involved in the development of this EIS. The chapter lists individuals with the Forest Service Interdisciplinary Team, resource specialist reviewers in the Forest Service, private sector subcontractors to Pioneer, personnel with Pioneer Environmental Services, Inc., the third party consultant for this EIS, and pre-proposal subcontractors.

5.1 Forest Service Interdisciplinary Team

The following Forest Service personnel served as members of the Forest Service Interdisciplinary Team and provided input for their area of expertise. Responsibilities included reviewing technical reports and data that had been prepared prior to VA's submitted proposal, the initial proposal, scoping comments, and drafts and final reports.

CONTRIBUTOR	EDUCATION & EXPERIENCE	CONTRIBUTION
Loren Kroenke Project Manager & Soils Specialist	B.S. Forest Recreation, B.S. Soil Science; 5 years as Developed Recreation -Winter Sports Staff, Aspen Ranger District; Forest Soil Scientist with the Routt National Forest for 8 years; 1 year as a Soil Scientist with the Soil Conservation Service	Interdisciplinary Team Leader, Soils, and Geology
Kit Buell Wildlife Biologist & Ecologist	B.A. Biology (Botany), Continuing Academics in Wildlife Biology, Fish Biology, Ecology, and Silviculture; 2 years as Wildlife Biologist with the Boise National Forest; 4 years as District and Zone, Wildlife and Fish Biologist with the Routt National Forest; 11 years as a Forestry Technician with the Forest Service in Colorado, Arizona, and California	Wildlife, Biodiversity, Aquatics, and Vegetation
Andria Holland-Sears Hydrologist/ Air Quality Specialist	B.S. Watershed Science, A.A.S. Forestry; 13 years as a Hydrologist and Air Resource Specialist, Lake Tahoe Basin Management Unit; 3 years as Hydrological Technician with various National Forest Research Stations	Hydrology, Wetlands, Aquatics, and Air Quality
David Van Norman Timber Specialist	B.S. Forestry; Continuing Education in Ecology and Silviculture; 6 years as Timber Forester and Silviculturist, White River National Forest; 9 years experience as a Timber Forester, Carson National Forest.	Timber Resources

CONTRIBUTOR	EDUCATION & EXPERIENCE	CONTRIBUTION
Kathy Hardy Archaeologist/ Recreation Specialist	B.A. Anthropology; 8 years experience as a recreation, wilderness, and lands specialist on National Forests in Idaho, Wyoming, and Colorado; 12 years as a Cultural Resource Manager and Archaeologist for the Lake Tahoe Basin Management Unit and the Sawtooth National Forest.	Recreation, Cultural Resources, Heritage Resources, and Land Use
Erik Martin Forest Winter Sports Specialist	Graduate Studies in Ecosystem Mgmt., B.S. Landscape Architecture; 22 years with the Forest Service working in ski area planning and administration.	Alpine Skiing and Visual Resources
William Wood District Ranger	B.S. Watershed Sciences; 7 years experience as District Ranger on the White River National Forest, 5 years experience as a timber, lands, and special projects manager on the Bighorn National Forest, and 8 years as a hydrologist on the Bitterroot, Plumas, and Bighorn National Forests.	Supervision and management of the Interdisciplinary Team and process; and review of the draft and final EIS documents.

5.2 Subcontractors

The following companies were subcontractors to Pioneer Environmental Services, Inc. for the development of this EIS.

CONTRIBUTOR	EDUCATION & EXPERIENCE	CONTRIBUTION
Metcalf Archaeological Consultants, Inc. Michael D. Metcalf Principal Investigator	M.A. Anthropology; 21 years exp. in Cultural Resource Management; author of numerous cultural resource reports used in NEPA documents.	Archaeological studies for cultural and historical clearances
Basin Hydrology, Inc. T. Mark Oliver, President Surface Water Hydrologist & Wetlands Specialist	B.S. Watershed Science; 15 years exp. in hydrologic and wetlands impacts analyses; author of numerous NEPA documents.	Review and oversight of hydrology section, consultation and assistance for WRENSS modeling
Geographics, Inc. Gerald Hughes Cartographer Keith Mass GIS Specialist	B.S. Geology; 20 years exp. in cartography including numerous EISs B.A. Landscape Architecture; 12 years exp. GIS analysis, remote sensing; author of GIS publications	GIS data base preparation and analysis GIS database preparation and analysis

5.3 Pioneer Environmental Services, Inc.

The following personnel with Pioneer Environmental Services provided work on this EIS.

CONTRIBUTOR	EDUCATION & EXPERIENCE	CONTRIBUTION
Roy D. Hugie Project Manager/NEPA Specialist/Wildlife Biologist	Ph.D. Forestry (Wildlife Management), M.S. Wildlife Management, B.S. Game Management; 25 years professional experience in Natural Resource Management; Author and producer of several NEPA documents	Principal in Charge; NEPA Specialist; general project oversight; contributing author to biological resource sections
Dan Christensen Assistant Project Manager	B.S. Communications & Media Management; Over 20 years writing, editing, and media operations; and project management for various governmental agencies.	Assistant Project Manager; NEPA Specialist; Environmental Analyst and Technical Editor
Neal Artz Socioeconomic Specialist Natural Resource Management	Ph.D. Range Science, B.S. Renewable Resources; 20 years experience with natural resource management; project manager for other ski area environmental studies; socioeconomic analyses; international environmental experience	Socioeconomic Analysis, Recreation and Alpine Skiing
Eve F. Davies Botanical and Wetland Resource Specialist/TES Species Specialist	M.S. Biology/Ecology, B.S. Biology; 4 years with Pioneer as Biologist/ Ecologist/TES Specialist; 8 years in botanical, mammalian, avian, insect, and reptile surveys and research.	Vegetation, Wetlands, Biodiversity, TES Species, and 404 Permitting.
R. Spencer Martin Terrestrial Ecologist/ Environmental Analyst	M.S. Environmental Management, B.A. Biology; 1 year with Pioneer as biologist/ecologist.	Geology, Soils, Hydrology and Wildlife
Thomas J. DeLiberto Wildlife Biologist/ Rangeland Scientist/Biodiversity Specialist	Ph.D. Rangeland Science, M.S. Wildlife, B.S. Wildlife; 1 year with Pioneer as Biodiversity /Wildlife Specialist	Wildlife and Biodiversity
John Stewart Wildlife Biologist/ Environmental Analyst	B.S. Range Science; 2 years with Pioneer as a Wildlife Biologist/ Environmental Analyst	Environmental Analyst; Transportation; Wetlands Impact Analysis; Botanical Surveys
Matthew Petersen Aquatic Ecologist/ Environmental Analyst	M.S. Aquatic Ecology; B.S. Wildlife and Fisheries; 4 years experience in aquatic research & biostatistics; 1 year with Pioneer as Aquatic Ecologist/ Environmental Analyst	Fisheries, Air Quality, Cultural Resources, Hydrology Modeling
Patrick J. Meyer Cartography	B.S. in Geography; 8 years Geographic Information Systems and Cartography.	Map Production and Geographic Analysis

CONTRIBUTOR	EDUCATION & EXPERIENCE	CONTRIBUTION
Beth Pyle Landscape Architect/ Environmental Analyst	M.S. Landscape Architecture; 1 year with Pioneer as Landscape Architect/ Environmental Analyst	Map Production, Visuals
Nancy J. Gregory Technical Production Specialist	B.S. Business Information Systems; 7 years document preparation and desk-top publishing; Office, database, budget, and computer management.	Document Technical Production
Jennifer Ott Clerical Assistance	B.S. Environmental Science; 8 years word processing, document preparation experience	Document preparation and production

5.4 Pre-Proposal Studies and Technical Contributors

The following individuals and firms conducted studies, inventories, collected data, or prepared reports prior to the submission of the CAT III area proposal. After review and acceptance by the Forest Service, this information was used in preparation of the EIS.

Land Plan Services—Vail Category III Resource Report Compendium

Goolsby Brothers and Associates, Inc.—Engineering Geology and Geologic Hazards Evaluation

James Walsh—Soil Inventory of the Category II and III areas

Air Sciences, Inc.—Air Quality Analysis

Dames & Moore—Vegetation Management Plan, Vail Master Plan Category III Implementation Resource Report

Western Ecosystems, Inc.—Several wildlife assessments and special studies

W.J. Miller and Associates—Aquatic resource information

Vail Associates Inc.—Chris Ryman, Mike Larson, Tom Allendar and Eric Toller

The various reports prepared are listed in Chapter 7 of this EIS.

CHAPTER 6.0 COORDINATION, CONSULTATION, AND DISTRIBUTION

6.1 Coordination

A list of important meetings pertaining to this EIS is provided below.

Date of Meeting	Subject of Meetings and Parties Involved
May 28, 1993	Preliminary Project Review — Forest Service
July 21, 1993	Wildlife Coordination Meeting — Forest Service, VA, Colorado Division of Wildlife (CDOW), and Private Consultant
February 8, 1994	Pre-proposal briefing — Forest Service, EPA (Lakewood, CO.)
February 18, 1994	Formal proposal from VA received by the Forest Service
February, 1994	Initial Scoping summaries distributed
March 7, 1994	Meeting with the officials and citizens of the Town of Redcliff
March 17, 1994	Notice of Intent to prepare an EIS published in the Federal Register
March 22, 1994	Briefing — TOV Council, VA, Forest Service
March 23 & 24, 1994	Public meetings in Minturn, CO. — Forest Service
April 16, 1994	Colorado Mountain Club Meeting- Greeley, CO. — VA, Forest Service
April 25, 1994	Meeting with Front Range Environmental Groups in Lakewood, CO.
June 14, 1994	Field visit/orientation to the project area — Forest Service, Pioneer
July 15, 1994	Project Coordination Meeting — Army Corps. of Engineers (ACOE) Forest Service, and Pioneer
July 19, 1994	CDOW Meeting at Minturn, CO.
August 10 & 11, 1994	Site Visit — ACOE, Forest Service, VA, Pioneer
August 15, 1994	Progress Review for the Forest Supervisor
August 18, 1994	Site Visit — Forest Service, VA, Environmental Group Representatives
August 22 & 23, 1994	Site Visit — Forest Service, Pioneer, ACOE

August 30, 1994	Record of Meeting Vail Ski Area EIS Socioeconomics, Meeting held August 24, 1994 — VA, Forest Service, BBC Research and Consulting, Arnold & Porter, Pioneer, RRC Inc.
December 12, 1994	Forest Supervisor Briefing and IDT Meeting — Forest Service internal meeting
January 10, 1995	Forest Service Update, CAT III — Forest Service, Colorado Mountain Club, Colorado Environmental Coalition, Southern Rockies Ecosystem Project, Representative of Colorado University Wilderness Study Group
January 11, 1995	Air Quality Meeting — Forest Service, EPA, TOV, VA, Colorado APED, Pioneer
January 25, 1995	Meeting with Eagle County — Forest Service, VA, Eagle County Planners
January 27, 1995	Wildlife Coordination Meeting — Forest Service, Colorado Division of Wildlife, Pioneer, TOV Council
February 8, 1995	Forest Service Update, CAT III — Forest Service, Sierra Club, Colorado Mountain Club, Dillon, CO.
February 15, 1995	Wildlife Coordination Meeting — CDOW, Forest Service, Pioneer, TOV, VA
February 15, 1995	Coordination Meeting — Forest Service, ACOE, VA, Pioneer
March 21, 1995	Vail Town Council Meeting, Topic: Resolution No. 4, Plan for Managed Growth — TOV, VA
April 4, 1995	Resolution No. 4, Approving and Adopting the TOV, VA Program to Manage Peak Periods.
April 6, 1995	Distribution of approximately 520 Forest Service newsletters
May 10, 1995	Meeting— Forest Service, CDOW at the Holy Cross District Office
May 15, 1995	Forest Supervisor Briefing, Glenwood Springs, CO.
June 13, 1995	Wildlife Coordination Meeting — Forest Service, CDOW, Pioneer, Eagle County, CO.
June 28, 1995	Meeting— Forest Service, EPA in Denver, Colorado
July 12, 1995	Project Area Site Visit — Forest Service, EPA, Pioneer

6.2 Consultation

All federal, state, county, and local agencies consulted for this EIS are listed below.

6.2.1 FEDERAL

U.S. Department of Agriculture, Forest Service

U.S. Department of Interior, Fish and Wildlife Service

Department of the Army, Corp of Engineers

U.S. Department of Interior, Environmental Protection Agency

6.2.2 STATE

Colorado Division of Wildlife

Colorado Department of Transportation

Colorado Department of Health

6.2.3 COUNTY

Eagle County Summit County

Lake County Eagle County Airport

6.2.4 LOCAL

Town of Vail Town of Frisco

Town of Redcliff Town of Minturn

Town of Avon Town of Leadville

6.3 Distribution

The agencies and groups listed below received copies of the Draft EIS. The individuals listed below received either copies or summaries of the Draft EIS.

6.3.1 FEDERAL, STATE, COUNTY, AND MUNICIPAL AGENCIES

Air Pollution Control Division	Eagle County School District	Town of Red Cliff
Colorado Department of	EPA Region 8	Town of Vail
Natural Resources	Lake County Commissioners	U.S. Army Corps of Engineers
Colorado Department of	Leadville Ranger District, San	U.S. Fish and Wildlife Service
Transportation	Isabel National Forest	
Colorado Division of Wildlife	Northwest Colorado Council	
Eagle County Commissioners	on Governments	
Eagle County Government	Town of Avon	
Eagle County Historian	Town of Minturn	

6.3.2 GROUPS/ORGANIZATIONS

Action Vail	Eagle Valley Environmental	Sierra Club - Vail Chapter
Ancient Forest Rescue	Alliance	Southern Rockies Ecosystem
Backcountry Skiers Alliance	Ft. Collins Public Library	Project
Beaver Creek Cross Country	Vail Daily	Summit Huts & Trail
Center	Gore Range Group of CMC	Association
Blue Mesa Forest Products	Holy Cross Jeep Club	Tenth Mountain Hut
Sierra Club - Blue River	Huron Partners INC.	Association
Group	Marwen Foundation	The Golden Bear
Boulder Public Library	Paragon Guides	U.S. Recreational Ski
Colorado Environmental	Piney Valley Ranches Trust	Association
Coalition	REMAX Vail, Inc.	U.S. Ski Team Passport
Colorado Heli-Ski	Sierra Club - Mt. Sopris	Vail Associates
Colorado Mountain Club	Group	Vail Public Library
Colorado Mountain College	Sierra Club - Roaring Fork	Vail Trail
CU Wilderness Study Group	Chapter	Vail Valley Times
Denver Public Library	Sierra Club - Rocky Mountain	Wilderness Society
Eagle Valley Enterprise	Chapter	

6.3.3 INDIVIDUALS

Paul Abbott	Jim Bove	Bruce Chapman	Anne Esson
Mary Jo Allen	Susan Boyd	Chris Jouflas	Karl H. Fauland
Spencer Anthony-	Thomas J. Britz	Michael Cockrell	Charles F. Fishback
Cahill	Dick Brooks	Eileen Connors	Tom Fitch
Bob Armour	J. Brower	Bob Copeland	Joseph Foreman
Beverly & Tony	J. Bruce Yanke	Jim Cypser	Dan Fries
Baker	William Brunworth	Ralph E. Davis	Wendell Funk
Lee Bass	Lynn Buhlig	Harvey DeWitt	Michael Gillespie
Curt Bender	Don Byers	John Domingue	Tim Glasco
Steven Berkowitz	Jeff Campbell	Dr. Jim Ebersole	Donald V. Glen
Mark Blickenstaff	Randy Campbell	Buck Elliot	James M. Gregg
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Ron Haddad	Kurt Kunkle	William Nollsch	Christopher Q.
Elizabeth Harms	Conrad Lattes	Tom Olden	Stephen
David Hatcher	Robin Leedle	Abbie Peters	Darlene Stookey
Dawn N. Hazelett	Peter Looram	Victor Pierson	Hjalmar S. Sundin
Mell Henderson	Dan MacNulty	William J. Post	Steve Tidball
Gary Hendrix	Bonnie S. Margolin	Alice Ranney	Cal Tilden
Tim Hogan	Michael Matzko	Robert Ray	Mike Tucker
Lee Hollis	Ginny May Phillips	David Richerson	Anne Vickery
Andrew Hood	Rosalind McClellan	Higinio H. Romero	John M. Wade
Don Ingalsbe	Steve McEachron	Paul Rondeau	Connie Walker
Robert Jackson	Sherry A. Meiling	Sue Rychel	Martin E. Walter
Jerome Jacobs	David Meirowsky	Eloy Sandoval	John G. Warner
Tom Johnson	Scott Miller	Jan Schneider	George Wear
Tom Jones	Bert Mochel	Don Simonton	Albert G. White
Leslie Jordan	Ed Moore	Robert Small	Marcia Wild
Michael Johnson	John Morrone	Rocky Smith	Alinda H. Wikert
Gilda Kaplan	J. Morrow	Nancy Smith	David O. Williams
Dawn Keating	Jean Nauman	Mike Spaniola	Bill Wilto
Dr. Vaughan	Dick Neal	John Spezia	Jim Witler
Kendall	David E. Nelson	Becky Sprague	
Walter Kirch	Dean Neuwirth	Erica Springstead	

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GLOSSARY

- ACOE:** U. S. Army Corps of Engineers. The federal agency charged with enforcing the Clean Water Act by regulating dredge and fill activities in wetlands.
- Acre-foot:** The amount of water necessary to cover one acre to a depth of one foot, equaling 43,560 cubic feet.
- Action Alternatives:** Any alternative that includes development of downhill skiing facilities in the CAT III Project Area.
- Adverse Effect:** An action that has an apparent direct or indirect detrimental effect.
- Agreement:** As used in this EIS, a joint program between the Town of Vail and Vail Associates to manage peak-period growth.
- Air Pollution:** The presence of contaminant or pollutant substances in the air that do not disperse properly and interfere with human health or welfare, or produce other harmful environmental effects.
- Airshed:** A geographical area that, because of topography, meteorology, and climate, shares the same air. The Clean Air Act establishes three air quality classes (I, II, and III), each with defined air quality standards. Generally, Class I is the designation for clean, pristine airsheds, including National Parks exceeding 6,000 acres and wilderness exceeding 5,000 acres. The Class II designation is applied to clean air areas where a moderate amount of development could be permitted. Areas designated as Class III could have a significant amount of development, as long as National Ambient Air Quality Standards are not exceeded.
- Allele:** A particular form of a gene, distinguishable from other forms or alleles of the same gene.
- Alluvium (Alluvial Deposits):** A general term for clay, silt, sand, and gravel or similar unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its flood plain or as a cone or fan at the base of a mountain slope.
- Alternative:** One of several ski area development plans evaluated in detail in this EIS. NEPA requires that agencies objectively explore all reasonable alternatives (40 CFR 1502.14).
- Available Water Capacity:** The capacity for a given soil to hold water that is readily available for absorption by plant roots.
- Avalanche:** Mass movement of snow down a slope, possessing potentially destructive forces.
- Background:** The visible terrain beyond the foreground and middle ground where individual trees are not visible but blended into the total fabric of the forest stand. Area located between 3 to 5 miles and infinity from the viewers. Also see middle ground and foreground.
- Baseline Condition:** The existing dynamic conditions prior to development, against which potential effects are judged.

- Baseline water yield:** The sustained runoff, composed of groundwater runoff and delayed surface runoff.
- Big Game:** Those species of large mammals normally managed for sport hunting, typically referring to deer, elk, black bear, and mountain lion.
- Biodiversity:** The variety of life and its processes. It includes the variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning, yet ever changing and adapting.
- Biological Assessment:** An evaluation conducted for federal projects requiring an environmental impact statement in accordance with the legal requirements under Section 7(e) of the Endangered Species Act as amended (16 U.S.C. 1536 (c)). The purpose of the assessment is to determine whether the proposed action “may” affect any endangered or threatened species or critical habitat.
- Biological Evaluation:** An evaluation conducted to determine whether a proposed action is likely to affect any species which are listed as sensitive (USDA-FS) or as a candidate (USDI-FWS) for listing as threatened or endangered under the Endangered Species Act, 1973, as amended.
- Biological Opinion:** An official report by the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS) issued in response to a formal Forest Service request for consultation or conference. It states whether an action is likely to result in jeopardy to a species or adverse modifications of its critical habitat.
- Calving Habitat:** An area, usually on spring-fall range, where cow elk give birth to calves and maintain them during their first few days or weeks. For the purposes of the EIS, calving habitat was identified as aspen stands below 10,500 feet in China, Teacup, Sun Up, Sun Down, and Game Creek bowls.
- Candidate Species:** Those plant and animal species that are being considered by the FWS for possible addition to the list of endangered and threatened wildlife and plants under the Endangered Species Act of 1973, as amended.
- Clean Air Act and Amendments:** Legislation dealing with air quality. Enacted by the U.S. Congress and amended in 1970, 1977 and 1990 to protect public health and welfare.
- Clean Water Act:** An Act that was enacted by the U.S. Congress in 1977 to maintain and restore the chemical, physical, and biological integrity of the waters of the United States. This act was formerly known as the Federal Water Pollution Control Act (33 U.S.C. 1344).
- Clearing:** The removal of vegetation, usually referring to only trees (canopy cover). Understory plant species would normally not be removed unless grading is done.
- Colluvium:** A deposit of rock fragments and soil material accumulated at the base of steep slopes as a result of gravitational action.
- Compaction:** The packing together of soil particles by forces exerted at the soil surface, which may retard plant growth and water infiltration.

- Core Reserve:** The central, most protected area of a concentric design for nature reserves where the intensity of use increases outward from the core and intensity of protection increases inward (Noss and Cooperrider 1994).
- Corridor:** A route that potentially allows movement of individuals or species from one region or place to another (Noss and Cooperrider 1994).
- Cooperating Agency:** Any federal agency other than a lead agency which has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major federal action significantly affecting the quality of the human environment.
- Critical Habitat:** A formal designation which may be applied to a particular habitat that is essential to the conservation of a given threatened or endangered species. Critical habitat can have a less formal meaning when used outside the context of the Endangered Species Act, such as in the case of critical elk winter range and calving habitat.
- Cultural Resources:** Any site, structure, or object or group of sites, structures, or objects 50 years or older that have been made, modified, or used by humans in the past; also called historic resources or properties.
- Cumulative Impact:** The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.
- Day skiers:** Skiers who visit the ski area on a day-to-day basis, returning to their homes at the end of each day.
- Destination Ski Area:** A ski area that relies more heavily on those skiers who stay for one or more evenings in the local area.
- Direct Effect:** An impact which is caused by the action being considered and which occurs in the same time and place (40 CFR 1508.8).
- Discharge:** The volume of water flowing in a stream past a specific point in a given period of time.
- Dispersed Recreation:** Recreation that occurs outside of a developed recreation site and includes such activities as scenic driving, hunting, backpacking, and recreation activities in undeveloped environments.
- Displacement:** As applied to wildlife, forced shifts in the patterns of wildlife use, either in location or timing of use.
- Ecosystems:** A dynamic complex of plant, animal, fungal, and microorganism communities and their associated nonliving environment interacting as a functioning unit.
- Ecosystem Management Approach:** A Forest Service strategy to manage ecosystems to provide for all associated organisms, as opposed to managing for individual species.
- Edge:** The zone of transition between two or more elements of the environment; e.g., field and woodland or the zone where different plant communities meet or successional stages come together.

Edge habitat: Habitats occurring in the edge between two habitat types (such as forest and meadow) that have a higher diversity of flora, fauna, and microclimate.

Edge Tolerant Species: Plants or animals which prefer edge habitats and are not normally found in interior portions of a block of habitat.

Emissions: Substances discharged into the air.

Endangered Species: Any species of animal or plant which is in danger of extinction throughout all or a significant portion of its range. An endangered species must be designated in the Federal Register by the Secretary of the Interior. Disturbance of the habitat of threatened or endangered species is prohibited by the Endangered Species Act (ESA) (1973, as amended).

Endangered Species Act (ESA): A federal statute enacted in 1973 which provided for the protection of native wildlife threatened with extinction.

Environmental Assessment (EA): A document that identifies potential effects on the human environment of a proposed action to determine whether those effects may be significant.

Environmental Gradient: The change in ecological or environmental features across space, such as changes in elevation, moisture, temperature, or soil.

Environmental Impact Statement (EIS): A disclosure report required by the National Environmental Policy Act (NEPA) that documents the environmental effects of a proposed action that may significantly effect the quality of the human environment.

Environmental Protection Agency (EPA): The federal agency that monitors the quality of various aspects of the environment such as air and water quality. They also have an important role in the wetland regulations via review of 404 permits.

Ephemeral Stream: A stream that flows only during wet periods of the year.

Erosion: The wearing away or detachment of the land surface by running water, wind, ice, or other geological agents.

Erosion Hazard: Soil ratings used to make a relative comparison of a soil's erosion potential.

Evapotranspiration: The combined loss of water from a given area and during a specified period of time by evaporation from the soil surface and by transpiration from plants.

Finding of No Significant Impact (FONSI): A document that is prepared if the agency finds in an Environmental Assessment that the proposed action will not significantly affect the human environment. It must set forth the reasons for such a decision.

First-order Stream: A stream without any tributaries.

Floodplains: The land bordering a stream, built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage. Sometimes called bottomland.

Foreground: The detailed landscape found between 0 and one-half-mile from the viewer. Also see background and middleground.

Forest-interior species: Wildlife that are dependant on, or at least prefer, large blocks of undisturbed forest for successful growth and reproduction. Natural and human disturbances that fragment the forest tend to disperse these species to other undisturbed areas.

Forest Plan: A Forest Service document required by regulations for each National Forest that provides general standards and guidelines for activities and that identifies areas of management emphasis.

Fragmentation: The process by which habitats are increasingly subdivided into smaller units, resulting in their increased isolation as well as losses of total habitat area.

Game Management Unit (GMU): A definable geographical area with unique habitat or use-consideration that is managed to achieve a particular goal relative to big game population numbers and characteristics.

Glading: The removal of up to approximately one-third of the trees to facilitate developed downhill skiing.

Gradient: A measure of steepness comprised of vertical distance divided by the horizontal distance, usually measured as a percent. Gradient is used to describe streams and ski slope.

Grading: The complete removal of all vegetation and subsequent surface disturbance associated with modifying the topography or contour to make an area more skiable.

Groundwater: Water below the land surface.

Groundwater Discharge: The shallow subsurface movement of water away from the groundwater table, usually toward surface water bodies such as streams, lakes, and ponds.

Groundwater Inflow: The movement of shallow groundwater through openings in rocks and soil; it occurs in the zone of saturation.

Groundwater Recharge: The downward movement of water into the deeper groundwater system.

Habitat: Places where plants or animals naturally or normally live and grow for all or a portion of their lives.

Habitat Linkage: A defined tract of land, usually linear, that enables species to travel between areas of suitable habitat.

Habitat type: A classification of the vegetation resource based on dominant growth forms. The forested areas are more specifically classified by the dominant tree species.

Hydric Soil: A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper soil profile. Hydric soils that occur in areas having positive indicators of hydrophytic vegetation and wetland hydrology are wetland soils.

Hydrograph: A graph depicting streamflow over time, usually on an annual basis. Hydrographs reflect the retention and desynchronization capacity of a watershed.

Hydrologic: Relating to the properties, distribution, and circulation of water.

Impacts: Potential physical, biological, social, and economic results or effects of implementing alternatives examined in detail in this EIS. The terms “impact” and “effect” are used synonymously in this EIS.

Indirect Effect: An impact which is caused by the action being considered, but which occurs later in time or farther removed in distance, but which is still reasonably foreseeable (40 CFR1508.8).

Insignificant Impacts: Minor changes in the environment resulting from implementation of an alternative which are thought to be of minimal or no consequence.

Instream Flows: Minimum instream flow is defined as the streamflow necessary to maintain aquatic life. These flows are determined by the Colorado Division of Wildlife (CDOW).

Interdisciplinary Team (IDT): A team of Forest Service employees that collectively represents several disciplines and whose duty it is to conduct, oversee, and review the environmental analysis and EIS.

Intermittent Stream: A stream that flows above-ground at intervals or only flows periodically during the year.

Irretrievable: Applies to losses of production, harvest, or use of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible: Applies primarily to the use of nonrenewable resources, such as mineral or cultural resources or to factors such as soil productivity that are renewable only over long time periods. Irreversible also includes loss of future options.

Issue: A point, matter, or question of public discussion or interest to be addressed or decided through the planning process.

Jurisdictional Wetlands: Wetlands that are subject to regulation by the U.S. Army Corps of Engineers, which issue permits for dredging and filling activities under Section 404 of the federal Clean Water Act of 1977.

Landscape Area (LA): A spatial scale of analysis used in evaluating project effects on vegetation and wildlife. In this EIS it consists of Category III and surrounding areas and encompasses approximately 41,178 acres. For a map showing the boundaries of the landscape area, see MAP 6.

- Landslide:** A generic term covering a wide variety of mass-movement processes involving the downslope transport of soil and rock material.
- Level of Service (LOS):** An expression of the amount of traffic that passes through a section of highway versus the capacity of that section. It is described both in terms of a ratio of volume to capacity and travel conditions.
- Long-Term Impact:** An impact which continues for an extended period of years. May also be permanent.
- Macroinvertebrates:** Invertebrates that can be detected with the unaided eye.
- Management Area Forest Prescription:** A management strategy or emphasis which is identified in the Plan and applies to specific areas of the National Forest.
- Management Indicator Species (MIS):** One that indicates habitat suitability for other species of similar habitat needs and are used to monitor and guide wildlife diversity. A decline in its population signals a decline for other species living in the area.
- Manage-to Capacity:** A flexible management framework which utilizes an interdisciplinary forum to make decisions regarding allowable skier numbers as ski area peak capacity is approached (Appendix A).
- Master Development Plan (MDP):** A conceptual program for long-term development and operation of a ski area over time. It is required as a condition of the special use permit (SUP).
- Mesic:** Environmental situations characterized by moderately moist conditions.
- Middleground:** The visible terrain beyond the foreground where individual trees are still visible but do not stand out distinctly from the stand. The area located between one-half and 3 to 5 miles from the viewer. Also see background and foreground.
- Mitigation:** Actions taken to avoid, minimize, or compensate for adverse environmental impacts. Mitigation actions may include: 1) avoiding the impact altogether by not taking a certain action or parts of an action, 2) minimizing impacts by limiting the degree or magnitude of the action and its implementation, 3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment, 4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action, and 5) compensating for the impact by replacing or providing substitute resources or environments.
- Modification VQO:** Changes that visually dominate the characteristic landscape and attract attention, but still reflect visual characteristics that occur naturally within the Central Rocky Mountain Character Type; to be achieved within one year of project completion. However, activities of vegetative and landform alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type. Additional parts of these activities such as structures, roads, slash, root wads, etc., must remain visually subordinate to the proposed composition.

National Ambient Air Quality Standards (NAAQS): Established under the Clean Air Act of 1963, there are primary standards designed to protect public health and secondary standards designed to protect public welfare from known or anticipated air pollutants. Enforcement of the NAAQS has been delegated by the EPA to the Air Pollution Control Division of the Colorado Health Department.

National Environmental Policy Act of 1969 (NEPA): This law requires the preparation of environmental impact statements for every major federal action which may cause a significant effect on the quality of the human environment.

No Action Alternative: NEPA requires an evaluation of all reasonable alternatives. This includes the alternative of not taking the action or not allowing the activity proposed, which is referred to as the No Action Alternative.

Noxious Weeds: Introduced plant species that have been freed from natural controls that held their populations in check. They are distinguished by their chemistry, physical structures, reproductive capabilities, and severity of impacts on natural vegetation.

Off-site Impacts: An impact associated with the implementation of an alternative which affects the environment outside the boundaries of the Project Area. Usually used in reference to affects which may occur off National Forest lands.

Old-Growth Stand: Any stand of trees generally containing the following characteristics: 1) stands contain mature and over mature trees in the overstory and are well into the mature growth stage; 2) stands will usually contain a multilayered canopy and trees of several age classes; 3) standing dead trees and down material are present; and 4) evidence of human activity may be present but does not significantly alter the other characteristics and would be a subordinate factor in a description of such stand. See the Vegetation section in Chapter 3 for further detail.

Palustrine System: All nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens.

Particulates: Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog, found in air or emissions.

Perennial Stream: A stream that flows throughout the year.

Periphyton: Aquatic microfloral growth found upon substrates.

Permeability: The capacity of a given soil type or natural aquifer to transmit water.

Permittee: A holder of a Special Use Permit (SUP) issued by the Forest Service. In the case of Vail Ski Area the Permittee is Vail Associates, Inc. (VA). VA is also the Proponent.

pH: A numeric value used to represent the acidity or alkalinity of an aqueous solution. The pH scale ranges from 0 (acidic) to 14.0 (basic). A neutral solution is 7.0.

Plant Communities: A vegetation complex, unique in its combination of plants, which occurs in particular locations under particular influences. A plant community is a reflection of integrated environmental influences on the site; i.e. soils, temperature, elevation, solar radiation, slope, aspect, and rainfall.

PM₁₀: Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.

Pod: A ski lift and an associated system of trails.

Potential Connected Disturbed Areas (PCDA): Potential areas of ground disturbance occurring within 100 feet of a stream channel.

Preferred Alternative: An indication of an agency preference from among the range of alternatives. NEPA requires that agencies identify their preferred alternative in Draft EISs, if one exists (40 CFR 1502.14).

Prehistoric: The period prior to a written record which may include Spanish exploration, trappers, miners, etc., but which generally refers to the previous Native American (aboriginal) occupants of the area.

Prevention of Significant Deterioration (PSD): An EPA program in which state and/or federal permits are required in order to restrict emissions from new or modified sources in places where air quality already meets or exceeds primary and secondary ambient air quality standards.

Project Area (PA): The geographic area where the physical developments associated with the Proposed Action and the alternatives would occur. Also, the smallest of the three analysis areas, and the one where most of the direct effects would likely occur. For the specific boundaries of the Project Area see MAP 5.

Proponent: The individual or business who is proposing the development, in this case, VA.

Proposed Action: The development plan submitted by VA and examined in detail as Alternative C.

Ranger District: An administrative subdivision of the National Forest supervised by a District Ranger, who reports to the Forest Supervisor.

Raptors: Any predatory bird such as a falcon, hawk, eagle, or owl that has feet with sharp talons or claws adapted for seizing prey and a hooked beak for tearing flesh.

Record of Decision (ROD): A document prepared within 30 days after the Final EIS is issued which states the agency's decision and why one alternative was favored over another, what factors entered into the agency's decision, and whether all practicable means to avoid or minimize environmental harm have been adopted, and if not, why not.

Recreation Opportunity Spectrum (ROS): Land classification system which categorizes land into six classes, each being defined by its setting and by the recreation experiences and activities it affords. The six management areas are: urban, rural, roaded natural, semiprimitive motorized, semiprimitive nonmotorized, and primitive.

Recreation Visitor Day (RVD): A unit for measuring recreation use, with 12 visitor hours in a visitor day. This may consist of one person for 12 hours, 12 persons for one hour, or any equivalent combination of continuous or intermittent recreation use by individuals or groups.

Recruitment Stand: Forest stands that meet most of the requirements (i.e., large trees, variation in tree size and spacing, standing and down, dead trees, decadence, multiple canopy layers, gaps in canopy, etc.), but do not meet the minimum age criteria for old-growth. These stands would generally meet old-growth criteria within 30 to 50 years if no disturbance occurs.

Regional Area (RA): A scale of analysis utilized in assessing impacts to vegetation and wildlife. In this EIS it refers to an area of approximately 753,316 acres. For the specific boundaries of the Regional Area see MAP 7.

Return Interval: The period of time expected to elapse between successive occurrences of events of a given size.

Riparian: The plant community located on the bank of a watercourse such as a stream or river.

Riverine: Habitats that are comprised of streams and their exposed channel banks.

SAOT: Skiers-at-one-time, a capacity measurement indicating the number of skiers that can use an area at one time.

Scoping: The process used to determine the range of actions, alternatives, and impacts to be considered in an EIS.

Scree: Stones or rocky debris.

Seasonal precipitation: The amount of rainfall an area receives on a seasonal basis.

Second-order Stream: A stream receiving only first-order tributaries.

Section 404(b) (1) Guidelines: A section of the Clean Water Act which authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits regulating the discharge of dredged or fill material into the waters of the United States, including wetlands and other special aquatic sites.

Sediment: Solid material, both mineral and organic, that is in suspension and is being transported from its site of origin by air, water, gravity, or ice, or has come to rest on the earth's surface. Generally refers to water-transported materials.

Sensitive Species: Those species of plants or animals that have appeared in the Federal Register as proposed for classification and are under consideration for official listing as endangered or threatened species under the Endangered Species Act. This also includes species that are on an official state list or that are recognized by the Regional Forester as needing special management to prevent their being placed on federal or state lists.

- Sheet Erosion:** The process by which a fairly uniform layer of soil is removed from the land surface by runoff water.
- Short-Term Impact:** An impact which occurs during construction and/or for 1 to 2 growing seasons thereafter. May also occur after brief activity associated with operation and maintenance.
- Significant Impact:** A subjective judgement based on the context and intensity of the impact. Generally, a significant impact is one which exceeds a standard, guideline, law, or regulation.
- State Implementation Plan (SIP):** Plan for conformance to National Ambient Air Quality Standards (NAAQS); required for any area not in attainment with NAAQS. Defines the program and schedule to attain and maintain the standards.
- Skier Days:** An expression of annual use, or visitation, at a ski area. Generally, one skier-day is the equivalent of one daily lift ticket.
- Slash:** The wood residue left on the ground after timber cutting and/or accumulating there as a result of storm, fire, or other damage. It includes unused logs, uprooted stumps, broken or uprooted stems, branches, twigs, leaves, bark, and chips.
- Snag:** Any standing dead tree or portion of the stem of a standing dead tree having a minimum diameter at breast height of 10 inches and a minimum height of 10 feet.
- Snag-dependent species:** Wildlife that are dependent on, or at least prefer, a standing dead tree for successful growth and reproduction.
- Special Use Permit (SUP):** A legal authorization issued by the Forest Service to a permittee which defines the terms of occupancy and use of specific areas of the National Forest. Regulations for issuing and administering SUPs are found in 36 CFR 251.
- Special Aquatic Sites:** Defined by the U.S. Environmental Protection Agency as geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. Special aquatic sites include, but are not limited to, wetlands, mudflats, riffle and pool complexes, and vegetated shallows. All special aquatic sites are afforded equal protection under Section 404 of the federal Clean Water Act.
- Species of Special Concern:** A category of plant and animal species that includes state and federally listed threatened and endangered species, candidate species, and forest-sensitive species.
- Stand:** Timber possessing uniformity as regards to type, age class, risk class, vigor, size class, and stocking class.
- Standard Practices:** A practice or combination of practices that are the most effective and practical means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals. This includes technological, economic, and institutional considerations.
- Subnivean:** Living under snow.

Subnivean mammal: Those that remain active during winter between the soil surface and the surface of the snow.

Succession: The process of plant community development that involves changes in species, structure, and community processes with time.

Swales: A low-lying stretch of land (such as a small meadow, swamp, or marshy, heavily vegetated depression).

Synoptic: Displaying atmospheric conditions and weather conditions as they exist over a broad area.

Synthetic hydrograph: A relationship of discharge vs. time developed using established procedures or assumptions when site-specific flow information is not available.

T-Walk Survey: A procedure consisting of biological and geomorphic evaluations used to determine the "health" of a stream. It can also be used to monitor the effects of a specific land use activity (roads, vegetation removal for ski trails, etc.) on a stream system.

Taxa: Taxonomic categories (species, genera).

Thermal Cover: A habitat type for large herbivores that provides temperature protection. This usually is provided by stands of trees.

Third-Order Stream: A stream receiving only first- and second-order tributaries.

Threatened Species: Any species of animal or plant which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of Interior as a threatened species.

Total Suspended Particles (TSP): Particulates suspended in the air which are less than 100 microns in diameter, such as dust from roads and fireplaces.

Turbidity: Cloudiness in water due to suspended and colloidal organic and inorganic material.

Understory: Refers to the layer of vegetation growing beneath another, such as a shrub community below trees.

Visual Absorption Capacity (VAC): The susceptibility of the landscape to visual change or the capability to "absorb" alteration while retaining its inherent visual character. Three categories of landscape features—High, Moderate, and Low, each with several descriptive attributes—are established by the Forest Service Visual Resource Management Manual (FSM 2380) to characterize VAC.

Visual Quality: Describes the degree of variety in the landscape, created by basic vegetative patterns, landform, and water forms. Landscapes with the greatest variety or diversity have the greatest potential for high scenic value or visual quality.

Visual Resource: The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

Water Quality: The biological, physical, and chemical properties of water that make it suitable for specified uses.

Watershed: The physical terrain from which all waters drain into a specific stream or river.

Waters of the United States: Under the Clean Water Act of 1977, this term refers to: the territorial seas of the United States; coastal and inland waters, lakes, rivers, and streams that are navigable waters of the United States, including their adjacent wetlands; tributaries to navigable waters of the United States, including adjacent wetlands; interstate waters and their tributaries, including adjacent wetlands; and other waters of the United States not identified above, such as isolated wetlands, lakes, intermittent streams, prairie potholes, and other waters that are not a part of a tributary system to interstate waters or navigable waters of the United States, the degradation or destruction of which could affect interstate commerce.

Wetlands: Areas that are inundated by surface or ground water with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction (Executive Order 11990). Under normal circumstances, the area does, or would, support a prevalence of vegetative or aquatic life.

Wilderness: The Wilderness Act of 1964 defines wilderness as follows:

"A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act, an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive experience."

Winter Range: That part of the home range of species where 90 percent of the individuals are located during the winter at least five out of ten winters.

Xeric: Refers to environmental situations characterized by arid conditions.

APPENDICES

- A: Vail Proposal Letter and
The Program to Manage Peak Periods
- B: Plant Species List and Detailed
Vegetation Impact Analyses for the
Project Area
- C: Existing Wetland Acreage and Detailed
Wetland Impact Analysis Tables
- D: Frequency of Various Forest Block
Species
- E: Forest Plan Consistency Analysis

APPENDIX A

Vail Proposal Letter

The Program to Manage Peak Periods

Vail Proposal Letter



Vail Associates, Inc.

Creators and Operators of Vail and Beaver Creek® Resorts

February 18, 1994

Mr. William Wood
District Ranger
White River National Forest
Post Office Box 190
Minturn, Colorado 81645

WRNF Holy Cross RD			
FEB 18 1994			
Act	Info	Act	Info
DIST TRNG		WTR SPIS	
REL Fer		Snow Ranger	
Ld Fer		S S Super	
Rce Plan		Fes Ck	
Trl G Wld		Per Ck	
RES FOR		Wd Ck	
Prossle		TECH ENG	
Pre S Tech		Eng Tech 1	
TS Admin		Eng Tech 2	
Pst S Tech		Eng Tech 3	
Eng Con			
Copy		File	

RE: Implementation of the Category III Decision as Specified in the Vail Master Development Plan, Revised May 15, 1987.

Dear Bill,

Vail Associates proposes to implement the Category III decisions specified in the Vail Master Development Plan, revised May 15, 1987, and in the related Decision Notice of December 1, 1986. The proposal is to complete site specific development of ski facilities and associated lifts in the Category III area. This entire area is within our existing U.S. Forest Service Permit Boundary, as originally established in 1961 and modified in 1986. The bowls in Category III have historically been referred to as Commando, Pete's and Super. See attached map.

The Category III development is a stand-alone proposal. It represents the logical progression of the future ski development of the area, utilizing existing infrastructure without requiring extensive modifications to the remainder of the Vail Ski Area. It will provide better bowl and glade skiing terrain, particularly, in the early and late season, and improve the distribution of skiers over the entire ski area. As such, it should enable us to increase our visitation during traditionally slow periods, without increasing the number or size of peak days.

During the same period that we develop Category III, we would also like to install a new Tea Cup Bowl lift within the Category II area. This lift would improve service to the China, Tea Cup, and Sun Up Bowl areas, while complementing and enhancing our proposed Category III development. It is, however, independent of Category III.

Implementation of these projects will be dependent upon the time required to conduct the site specific environmental analysis. Conceivably, installation of the Tea Cup Bowl lift could take place in the summer of 1995, the first phase of construction of the Category III improvements could also begin in the summer of 1995. Due to logistics, construction phasing over two or more summers may be advantageous within Category III.

The National Environmental Policy Act (NEPA) process will be used to analyze potential environmental impacts of the proposed action and, if necessary, to identify appropriate mitigation measures. The

U.S.F.S. is responsible for all aspects of conducting the NEPA process. As with any planning process, this project will evolve as additional information becomes available.

BACKGROUND

In 1986, the Forest Service conceptually approved development in the Category III area as part of our Master Development Plan. The Service indicated, however, that site specific environmental review would be required before a specific development proposal could be approved and implemented.

Since 1986, we have conducted a number of specialized studies to compile information on the Category III area and develop our proposal. Much of this work was undertaken in conjunction with a team of Forest Service and Division of Wildlife specialists, and it involved extensive environmental research, field investigation and layout. Potential development scenarios have been evaluated from the standpoint of wildlife habitat, wetlands, vegetation, water quality, geology, safety, and visual impact. Independent on-mountain surveys and extensive focus group interviews have been used to determine which improvements are most desired by our guests. A list of underlying environmental studies, with subject, author and date published has been included as an appendix to this proposal letter. These studies provide the basis for, and should be incorporated into, the environmental review of Category III.

Through this multi-year planning effort, we have developed a proposal which, we believe, will set a new standard for environmentally sensitive ski development and the wise use of public resources. It reduces the anticipated development outlined in our Master Development Plan, and is the minimum lift configuration necessary to serve the Category III area. We have paid special attention to preserving natural contours, avoiding wetlands and potential old growth tree stands, and preserving or enhancing wildlife habitat.

The Category III area is in the Two Elk drainage, within the White River National Forest and encompasses all, or parts of Sections 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, T. 5 S., R. 80 W., and Sections 3, 4, & 5, T. 6 S., R 80 W., Eagle County, State of Colorado.

PROPOSED IMPROVEMENTS

The following description outlines the principal components of the improvements proposed within Category III.

- Three chair lifts would serve the terrain within Category III. A central ridge lift from the bottom of Tea Cup Bowl to the ridge between Pete's and Super Bowl would service excellent sheltered skiing terrain and provide circulation to the other two Category III lifts. An eastern lift would provide skier access to all of Pete's Bowl, with a western lift providing skier access to the terrain in Super Bowl and the eastern edge of Pete's Bowl. This lift scenario does not introduce developed skiing into Commando Bowl.
- Three food service facilities are also proposed. One would be a full service restaurant, located near the base of Pete's Bowl and would serve skiers from both the China Bowl area and the Category III area. The two other facilities would be of a more limited/self-contained nature, providing food service, rest rooms, and a warming/weather protection function. The feasibility of installing a sewer line from the existing line on Vail Mountain to these facilities is being investigated; an alternative

being considered is the utilization of composting rest room technology in conjunction with gray water leach fields. Other utilities such as power and telephone would also be installed within Category III.

- Two ski patrol outposts will be necessary to serve the Category III area. They will be in the vicinity of the upper terminals of the Pete's and Super Bowl lifts. Small guest shelters with public rest rooms may also be necessary at the top of these lifts.
- A limited system of dual purpose, skiway/service roads would be required from the bottom of Category III to the proposed lift terminals and food service facilities. As is the policy on all of Vail Mountain's service roads, no public motorized use will be allowed within Category III. Bridges will be used to cross Two Elk Creek; skiers may utilize some existing natural crossings .
- A system of natural ski terrain, gladed areas, and conventional ski trails would be developed through the Category III area. This system would consist of approximately 400 acres of natural terrain, 300 acres of gladed terrain, i.e., areas where 10 to 40% of the existing tree cover is removed, and 300 acres of conventional ski trails, for an approximate total of 1,000 acres of developed ski terrain.

The balance of the Category III area will be left in its current, natural condition, and will be used as buffer areas, for boundary and avalanche control, and terrain for expert skiers. The locations of the proposed improvements are depicted on the attached map.

Developed summer recreation facilities or programs within the Category III area are not included in this proposal. Due to a wildlife calving agreement with the U.S.F.S. and the D.O.W., recreational use in China Bowl is currently prohibited from mid-April through July 1 each year.

There are no snowmaking installations included in the proposal.

CAPACITY

We believe that the implementation of Category III will not increase the peak day capacity of the ski area.¹ Our peak day capacity is currently constrained by initial lift service, parking, and the local transportation system, that is, by the ability of our customers to access the ski area. These constraints will not be changed by the implementation of Category III. Instead, Category III will help us to increase our visitation during slow periods, by providing better bowl and glade skiing in the early and late season and improving the distribution of skiers and the quality of their experience during peak periods.

We recognize that during peak days the level of visitation has historically placed demands on infrastructure and services which diminish the overall quality of the guest experience and inconvenience residents. This problem exists independent of Category III. Five years ago, Vail Associates recognized the demands that peak days place on community infrastructure and services and adopted a strategy of managed growth to alleviate those demands. The strategy includes providing incentives for skiers to visit

¹The 1986 Environmental Assessment on our Master Development Plan indicates that the development of Category 3 could increase our theoretical capacity by 4,802 skiers-at-on-time (S.A.O.T.). However, the Environmental Assessment cautions that this number "is solely based upon peak lift capacity which is conceptually planned" for the Category 3 area and that further analysis "could result in changes to the theoretical capacity." Our further analysis of this issue has led us to conclude that while the Category 3 development will add additional lift capacity in the Category 3 area, it will not increase the capacity of the ski area, which will remain constrained by the limitations noted above.

Vail during slower periods of the season, such as early/late winter and during the middle of the week. Over the past five years, Vail Associates has been successful in building skier visits on low to moderate days, while at the same time reducing the number of peak days by almost fifty percent.

Vail Associates and the Town of Vail are discussing mechanisms and techniques for maintaining the quality of life, better anticipating the needs of residents and guests, and reducing future demands on the local infrastructure at peak periods. While this issue exists independent of Category III, it nevertheless deserves attention by Vail Associates, as well as the Town of Vail and other community organizations.

PURPOSE AND NEED

The proposed action is to develop ski facilities and lifts in the Category III area. All of the area under review is within Vail's existing Special Use Permit. The following points describe the different purposes and needs behind this proposal.

1. Enhance Early and Late Season Skiing Experiences. Over the past 30 years during the Christmas and New Year period, Vail's Back Bowls have been closed approximately 25% of the time due to poor snow conditions. Even when the Back Bowls have been open during this period, ski conditions have been marginal one out of three years. Development of ski facilities within Category III will provide high elevation, north-facing bowl skiing at Vail, ensuring the best possible natural snow conditions during the early and late ski seasons.
2. Improve Bowl Skiing Throughout the Ski Season. At any time during the ski season, adverse light, weather, and or snow conditions can make back bowl skiing very difficult. Category III will provide more reliable and consistent conditions for skiers at these times.
3. Dramatic Increase in Intermediate Terrain / Improved Distribution of Skiers. Not only will Category III create new bowl opportunities for skiers at Vail, it will expand overall intermediate terrain at the resort. On high use days, the front side of Vail Mountain experiences intensive use of intermediate terrain. With Category III, we anticipate far better distribution of intermediate skiers, resulting in improvement in the quality of the guest's experience.
4. Provide Gladed Skiing Experience. The front side of Vail Mountain does not currently provide significant tree or gladed skiing terrain. In Category III, gladed skiing experiences can be provided. Research by Vail indicates that this experience is sought by its destination and international guests.
5. Enhance Economic Vitality to Vail and the Surrounding Areas. Through enhancement of early and late season skiing opportunities and improvement of skiing opportunities during the ski season when conditions are marginal, Category III will help to stabilize economic activity within Vail and the adjacent communities.
6. Minimize Impacts to Resource Values. Category III has been designed to provide additional ski opportunities while minimizing adverse impacts to resource values. This has been accomplished by carefully siting facilities to minimize such impacts, utilizing existing infrastructure on Vail Mountain and reducing the scope of the project as originally proposed in the 1986 Master Development Plan.

NEW TEA CUP LIFT

In a similar but independent action, one chair lift is proposed to run from the bottom of Tea Cup Bowl to the top of the west wall of China Bowl.

This independent action is an important part of efficiently utilizing the current Category I and II facilities on the back side of Vail Mountain.

The Tea Cup Lift accomplishes several critical functions:

1. Provides a backup evacuation lift in the event that the Category II lift, the Orient Express, suffers a mechanical break down and cannot return skiers to the front side of the Mountain. This evacuation function was expressly contemplated in the 1986 Master Development Plan.
2. Would allow far greater utilization of both the west wall of China Bowl and all of the terrain within Tea Cup Bowl.
3. Provides a more direct linkage between China Bowl, Tea Cup Bowl, Sun Up Bowl and the front side of Vail Mountain.
4. Improves distribution of skiers in China Bowl, Tea Cup Bowl, Sun Up Bowl and on the front side of Vail Mountain.
5. Provides a more direct end of the day egress route from China Bowl and Tea Cup Bowl to both Vail Village and Lionshead.

At the same time, the Tea Cup Lift will help facilitate use of Category III. First and foremost, it will return skiers from Category III to the front side of Vail Mountain. In addition, during low snow conditions on the back side of Vail Mountain, the Tea Cup Lift would be used to download skiers from the front side of the Mountain to Category III.

While including the Tea Cup Lift in this overall proposal, Vail Associates reserves the right to request that the Forest Service separate this lift from the larger Category III review process and have its review considered separately. Such a request would be made if the schedule for the Category III environmental review falls behind, jeopardizing a summer of 1995 construction start on the Tea Cup Lift.

RELATIONSHIP TO CURRENT PLANNING DOCUMENTS

The Category III proposal reflects the expectations of Vail Associates, Inc. for development opportunities based on past Forest Service planning efforts and associated decisions. The Category III area was specifically addressed and identified as a Priority 1 development area in the following documents:

- 1983 Regional Guide FEDS/ROD
- 1985 Forest Plan FEDS/ROD
- 1986 Recreation Appendix to the Forest Plan
- 1990 Forest Plan Recreation Amendment
- 1992 Revision of the Regional Guide

The Environmental Assessment/Decision Notice (EA/DN) for the Vail Master Development Plan, December 1, 1986, specified that the Category III area be included under Special Use Permit, but stipulated that no construction would be allowed before site specific environmental analysis was conducted. It is important to note that this DN required that Vail Associates, Inc. come forward with site specific development plans for Category III by December 1, 2001, or risk deletion of the area from the Special Use Permit.

The Management Area Prescription is 1B. The prescription summary states that,

"Management emphasis provides for downhill skiing on existing sites and maintains selected inventoried sites for future downhill skiing recreation opportunities. Management integrates ski area development and use with other resource management to provide healthy tree stands, vegetative diversity, forage production for wildlife and livestock, and opportunities for non motorized recreation."

This proposal is also in conformance with the goals and objectives of the 1985 White River National Forest Plan and the 1990 Recreation Amendment to the Forest Plan, and it would further the policies set forth in the Regional Supply and Demand Assessment and Recreation Assessment, which was incorporated into the 1992 Regional Guide. These goals, objectives, and policies generally recognize that this region is one of the world's winter recreation destinations and that such recreation supports local communities and their associated economies; they also provide that the Forest Service will assist in developing programs to meet the needs of recreation visitations and the National Forests will provide additional recreation opportunities contingent upon environmental reviews and plan approvals.

CURRENT USES OF AREA

The Category III area is currently used as a dispersed recreation area by the public.

Dispersed summer recreation use occurs mostly in the form of hiking and mountain biking on the Two Elk Trail (closed to motorized vehicles in 1986) and big game hunting in the fall. The Two Elk trail is not well-suited to beginner or intermediate mountain bikers. It is steep, narrow, and very rocky along much of its length and egress for all but advanced riders is very difficult. These same limitations affect hiking use. Finally, the mid-April to July 1 wildlife closure of China Bowl has proven to be generally successful and may need to be expanded into Category III.

Cross county skiing on the Commando Trail from Shrine Pass to Vail, through the eastern edge of Commando Bowl, is the extent of current dispersed winter recreation.

The entire Two Elk Creek drainage is currently, and has historically been, the site of livestock grazing, primarily sheep.

The area is mostly elk summer range, it may include some elk calving habitat, areas of potential old growth vegetation, and Canada lynx habitat (occupation of the habitat is not confirmed). In addition, Two Elk creek and beaver ponds associated with it are considered a good fishery for small brook trout.

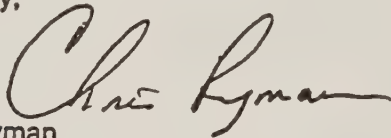
CONCLUSION

As previously stated, Vail Associates, Inc. proposes to implement the Category III decisions specified in the Vail Master Development Plan, revised May 15, 1987, and in the related Decision Notice of December 1, 1986. The proposal is to complete site-specific development of ski facilities and associated lifts in Category III.

This proposal is the culmination of four years of field analysis and resource evaluation; it reflects the input of local residents, guests, resource specialists, and operation's personnel. All major construction proposals have been flagged in the field in an effort to confirm feasibility and to facilitate further specialist evaluation. This proposal represents a reduction in the scope of the development as outlined in the 1986 Vail Master Development Plan and is the minimum lift configuration necessary to service Category III. It stresses the avoidance of wetlands and preservation and management of wildlife habitat, avoids potential old growth tree stands, and responds to the concerns of other forest users.

We at Vail Associates believe that Category III represents the finest natural ski terrain under Forest Service Permit today, and we look forward to working with you and your staff on the site-specific environmental analysis associated with this proposal.

Sincerely,

A handwritten signature in cursive script, reading "Chris Ryman".

Chris Ryman
Senior Vice President, Operations

APPENDIX

CATEGORY 3 PROPOSAL
SPECIALIZED STUDIES

Subject	Title	Author	Firm	Date
Air	Air Resources Management Plan		White River NF	1991
	Air Quality Analysis, Expansion of Vail Mountain and Development of the Valley, 1986 to 1993		Air Sciences Inc.	1985
Aquatics	Revised Draft - Two Elk Creek, Macro invertebrate and Periphyton Survey		W.J. Miller and Associates	1993
Avalanches	Avalanche Survey	Allender, Hughes	Vail Associates	1985
Cultural Resources	A Class III Cultural Resources Inventory of Vail Mountain's Category 3 Expansion in Eagle County, Colorado	Shields, Metcalf	Metcalf Archaeological Consultants, Inc.	1993
	Final Report of Archaeological Investigations at the Vail Ski Area, Eagle County, Colorado	Metcalf, Black	Metcalf Archaeological Consultants, Inc.	1985
Geology	Engineering Geology and Geologic Hazards Evaluation, Category 3 Area, Vail Ski Area, White River National Forest	Stover	Goolsby Brothers and Associates	1993
	Preliminary Surficial Geologic Mapping and Slope Stability Study of the Vail Ski Area	Stover	Colorado Geological Survey	1985
Soils	Soil Resource Inventory, Vail Mountain Category 3 Area	Buscher	Walsh & Associates, Inc.	1993
	Soil Inventory of the Category Two Area Vail Mountain, Eagle County, Colorado	Walsh	James P. Walsh -Associates, Inc.	1985
Transportation	Update on Existing Traffic Conditions and Capacity of Four-way Stop (Memorandum)	Rosall	Rosall, Remmen, Cares, Inc.	1986
	Potential Impacts of the Vail Master Plan Regarding Circulation, Parking, and Population Growth on the Town of Vail	Rosall, Cares	Rosall, Remmen, Cares, Inc.	1985

Subject	Title	Author	Firm	Date
Transportation continued	Vail Traffic Counts		Centennial Engineering, Inc.	1986
	Town of Vail Transit Development Plan Update, 1987 - 1991		Town of Vail	1986
	Final Report: I-70/Vail Feasibility Study		Centennial Engineering, Inc.	1984
Vegetation,	Vail Master Plan Category III Implementation, Vegetation & Wetland Water Quality Analysis		Dames and Moore	1993
Wetlands, Hydrology, & Water Quality	Vail Mountain Hydrologic Assessment		U.S.F.S.	1985
	Category 3 Hydrologic and Wetlands Survey		Dames and Moore	1993
	Unpublished Fish Survey Report. Two Elk Creek	U.S.F.S.	U.S.F.S.	1992
	Draft Fish Population and Aquatic Habitat Report for Two Elk Creek		W.J. Miller & Associates	1993
	Vegetation Management Plan for Vail Mountain Ski Area	Van Norman	U.S.F.S.	1992
Wildlife	Summary and Adequacy of Vail Ski Area Wildlife Studies for NEPA Analysis of the Proposed Category 3 Expansion	Thompson	Western Ecosystems, Inc.	1993
	Upper Eagle Valley Elk Study - Summary Report For Summer 1992	Alldredge	RFL Environmental	1993
	Colorado Lynx Survey: Winter 1992	Andrews	Colorado Division of Wildlife	1992
	The Effects of Ski Area Expansion on Elk Accuracy of 2 Telemetry Systems in Mountainous Terrain, Summer Data - 1991	Alldredge and Morrison	Colorado State University	1992
	Lynx Capture and Marking Study in the Vail Area: Phase 1	Byrne	Colorado Division of Wildlife	
	Elk Migration, Habitat Use and Dispersal in the Upper Eagle Valley, Colorado:	De Vergie and Alldredge	Colorado State University	1989

Subject	Title	Author	Firm	Date
Wildlife Continued	Preliminary Report of the Game Management Unit 45 Elk Study, Phase II, Jan. 15, 1985 to Dec. 17, 1986	Byrne	Colorado Division of Wildlife	1987
	Canada Lynx Presence on Vail Ski Area and Proposed Expansion Areas	Thompson and Halfpenny	Western Ecosystems, Inc.	1987
	Guidelines for the expansion of Vail Ski Area into Potential Canada Lynx Habitat	Thompson	Western Ecosystems, Inc.	
	Summary Report 1986-1988 Fall 1985 Big Game Migration Across Vail Ski Area, Colorado	Thompson	Western Ecosystems, Inc.	
	Spring 1986 Big Game Migration and Calving Studies on Vail Ski Area, Colorado (Unpubl. Rept.)	Thompson	Western Ecosystems, Inc.	1986
	Wildlife Assessment of the Proposed Vail Ski Area Expansion	Thompson	Western Ecosystems, Inc.	1985

The Program to Manage Peak Periods

A RESOLUTION APPROVING AND ADOPTING
THE TOWN OF VAIL/VAIL ASSOCIATES PROGRAM TO MANAGE PEAK PERIODS

WHEREAS, the Town Council of the Town of Vail and Vail Associates have engaged in open, frank discussions regarding growth issues within the Town and on the mountain; and

WHEREAS, the two organizations have worked together to establish common priorities and identify issues that will contribute to the future managed success of the community; and

WHEREAS, the agreement identifies common priorities which include, but are not limited to, transportation and circulation, housing, open space preservation, coordinating long range capital planning, and management of peak and nonpeak skier periods; and

WHEREAS, two of these common priorities are addressed by and through the project of mountain expansion known as Category III and the traffic circulation plan known as the Roundabouts; and

WHEREAS, the process of discussion and planning has resulted in an agreement to proactively manage growth issues in our community; and

WHEREAS, the results of this extensive effort are identified in a document entitled Strategies for the Future: Town of Vail and Vail Associates.

NOW, THEREFORE, be it resolved by the Town Council of the Town of Vail, Colorado that:

1. The Town Council/Vail Associates Program to Manage Peak Periods attached to this Resolution as Exhibit A is hereby approved and adopted.
2. Category III with regard to off-site impacts to the Town of Vail has the backing and support of the Town Council.
3. The Town of Vail hereby accepts those specific gravelbelt and stream beds currently under Vail Associates ownership that are to be conveyed to the Town of Vail for permanent open space purposes and the leases for the property on which the Pines Ship Park and Lionhead Trail Lot are presently located.
4. The Town Manager and the Town staff are hereby authorized to take all actions necessary to implement the Program to Manage Peak Periods.
5. This resolution shall take effect immediately upon its passage.

INTRODUCED, READ, APPROVED AND ADOPTED this ____ day of _____
1995.

ATTEST:

Margaret A. Osterhaus, Mayor

Holly L. McCutcheon, Town Clerk

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Strategies for the Future:
Town of Vail and Vail Associates

INTRODUCTION

In order to best serve the community (including residents, visitors, property owners and businesses) in the future, the Town of Vail and Vail Associates have begun to identify key issues necessary for the continued success of Vail and have created a plan to manage resort business growth. This plan will be implemented to aid various segments of the community in remaining economically healthy while maintaining Vail's quality of life.

Events in the last 24 months have provided a unique opportunity for the Town of Vail and Vail Associates to discuss issues relating to growth and the future. New ownership and management of VA, changes in the community, planning for the 1999 World Alpine Ski Championships and a renewed focus on growth issues on a local, regional and statewide basis have all made this an opportune time to re-focus the vision for the future.

During Vail Mountain's first year of operation the company recorded 61,000 skier days. In the 1993-94 ski season, Vail Mountain hosted 1,527,698 skier days. However, in the past 5 years, skier growth has slowed considerably, occurring at a rate of less than 2% per year. Nevertheless, growth will continue to present new opportunities as well as issues regarding the future of Vail:

- Are skier visits too concentrated in certain times of the season?
- How can Town and mountain infrastructure stresses be properly managed?
- Is the quality of life for residents being compromised by the growing popularity of the resort?
- How can these issues best be addressed?

With this in mind, Vail Associates and the Vail Town Council have made a great effort to come together on planning, organizational and strategic projects. The two organizations felt it would be beneficial to the community to improve communications. TOV and VA are striving to coordinate efforts to ensure consistent quality since the guest sees Vail as a seamless entity, with no distinction among the mountain operations, lodging, restaurants, parking and bus service. Thus, it is important that Vail continues to focus on the environmentally sensitive high quality of life of its residents while sustaining its positive economic climate as a world renowned resort.

PRIORITIES AND GOALS

The overall goal is to preserve the quality of the experience for guests, property owners and residents of Vail. In conceiving the plan for "continued success," members of the Vail Town Council and management of Vail Associates set out to establish common priorities. Those priorities include, but are not limited to, the following:

- management of peak and non-peak skier periods
- transportation and circulation
- housing
- open space preservation
- coordination of long-range capital planning

After formulating the above mentioned priorities, the Town of Vail and Vail Associates identified some of the short term and long term needs and issues facing the community on a year round basis. Although this is not a complete list of all issues that Vail faces, it is a start at establishing goals for looking ahead. They include:

- managed growth needed for vitality and preservation of the characteristics that have made Vail a success
- ambience and pedestrian character of Vail Village and Lionshead
- variety and caliber of shops, restaurants and lodging
- circulation through town (including street projects, recreational path improvements and roundabout projects or other solution to the current 4-way stop)
- accessibility to Vail: air and ground transportation
- efficient use of parking and introduction of regional transportation (including park and ride sites for employees and skiers and encouraging carpooling)
- accessibility to the mountain
- development of loading and delivery system to enhance the pedestrian character
- maintenance of quality of the environment (including air and water)
- commitment to year-round marketing
- ability to continue to attract and maintain quality work force and the quality of life for the work force
- maintenance of high guest service standards throughout Vail
- enhancement of the skiing experience on Vail Mountain (including the completion of the front side improvements, base area redevelopment and addition of reliable ski conditions and adequate, appropriate terrain for our guests, e.g. Category III) in order for Vail to maintain as a premier ski mountain
- VA continues to support the concept of merchant and student passes as a benefit to the community and will continue to address these programs on an annual basis

RESEARCH

Since 1979, Rosall, Remmen and Cares, (RRC) the Boulder based research firm has consulted with both the TOV and VA.

Through extensive focus groups and written surveys with guests, residents and employees, RRC has assisted and continues to assist VA in determining the level of support for a variety of capital improvements. This effort was conducted to aid management in updating the existing Vail Mountain Master Plan, which led to the installation of the seven new detachable quad lifts, expansion into China Bowl, the Two Elk Restaurant and expanded Mid-Vail facility. The focus of these efforts is for the benefit of the guests, residents, property owners and business community.

In citizen focus groups and town sponsored community surveys for 1993 and 1994, citizens have identified the following priorities: water quality protection, preservation of open space; traffic congestion remedies including public transit; affordable housing; air quality protection; protection of stream flow; and water capacity to serve future population needs. Strong support for public transit is seen as a reflection of the desire to reduce traffic congestion as well as to

reduce pollution. The surveys also reflect a desire for minimal or managed growth, but not at the expense of quality of life of the community or quality of the environment.

THE AGREEMENT

As part of an ongoing process, the Town of Vail and Vail Associates have proposed an agreement designed to proactively manage growth issues in our community. This plan recognizes the need for continued economic prosperity, without adversely impact the mountain and town infrastructures. It commits to further enhancing the quality of the Vail experience, recognized as a key component to our mutual success. From the beginning, it was evident that the process must be two-fold, addressing both marketing and infrastructure. The agreement reflects extensive discussions between representatives of the Vail Town Council and Vail Associates; its action items were formulated after considerable study, analysis and debate. Nonetheless, the success of this agreement will require greater participation of other parties within the community.

The agreement focuses on balancing visitor numbers throughout the ski season - instead of the ups and downs experienced in the past. While the reality of resort business is that peaks are inevitable, TOV and VA are striving to implement strategies for filling in the less busy times and becoming less reliant upon the peak times. The main goal is to protect against over-utilization during busy times and under-utilization during less busy times. By balancing the utilization, service needs can be predicted and addressed and staffing / employee opportunities can become consistent.

The agreement addresses ways to manage ski season 'peak periods' and 'non-peak periods'. Peak periods are identified as the week between Christmas and New Year's Day and weekends from President's Weekend through the end of March. The peak periods can at times be accompanied by high influxes of cars, traffic and parking problems - all of which compromise the quality of the Vail experience. Non-peak periods are identified as all times outside of the 'peak periods', including the early ski season, Thanksgiving, the pre-Christmas period, the January to mid-February period and the late ski season. During these periods of low to moderate use, the infrastructure, employment base, and economic opportunities of the community are underutilized.

Strategies for non-peak periods include:

- Aggressive and targeted marketing by VA, including promotional incentives with an International and Front Range focus
- Cooperative programs with lodges to create packages
- Value pricing programs
- Cooperative marketing efforts with the resort associations, chambers of commerce, lodging associations and others
- Creation of parking incentives, hosting of special events, and more cooperation with the community and merchant groups
- Addition of needed early season snow quality and adequate, appropriate terrain for our guests, e.g. Category III and enhanced front side snowmaking

Strategies for peak periods include:

- Limiting or adjusting promotional ticket incentives and marketing campaigns
- Extending mountain operation hours
- Increasing emphasis on public transportation use, including working with Eagle County to increase reliance upon vans and other public transportation to and from the Eagle County and Denver International airports and within TOV while encouraging reduced reliance upon rental cars (A comprehensive plan will be developed by no later than September 1, 1995)
- Adjusting parking and ski pass policies
- Staggering employee work hours
- Recognizing that peaks also occur in the summer season. Proper management of non-ski related events is critical to ensuring the quality of the Vail experience.
- Continuing Holiday Management Plan, adopted in 1993 and successfully implemented in 1993 and 1994, to reduce employee traffic by offering parking incentives to those who car pool and free bus passes for riders during the Christmas peak
- Improving the community's and guests' experience on the mountain by better distribution a circulation of skiers, e.g. Category III
- Improving skier access to the mountain from Vail Village, Lionshead and Golden Peak in order to reduce strains experienced in the past

In addition to operational coordination, out of this process it became clear that it is in the community's best interest to coordinate capital projects. A description of upcoming projects follows on pages 7 and 8. TOV infrastructure improvements such as the roundabouts at main Vail and West Vail intersections and VA infrastructure improvements such as Category III have been recognized as key items which will help to implement the strategies. All major infrastructure improvements are intended to enhance the quality of life for residents and the quality of the experience for guests.

The roundabout concept has emerged from a long list of possible solutions as the most viable and cost effective solution to safety, congestion and circulation problems experienced at the Main Vail and West Vail intersections. The modern roundabout achieves high capacity in a compact space, largely because of entry flare. Unlike a signalized intersection, in which only one or two movements occur at the same time, a roundabout allows all entries to work simultaneously with no lost time between movements. It is anticipated that the roundabout will most efficiently absorb current loads at the main Vail interchange. TOV and VA agree that the current situation must be improved upon and believe that the roundabout is the solution best suited for Vail.

Category III, part the original permitted ski area, is the third phase in Vail Associates' 1962 and 1986 Master Development Plan. Over 50% of Vail's skiers are classified as intermediates with this trend on the rise, while Vail Mountain provides only 35% of its terrain for intermediate skiing. The Category III area will ensure snow quality with intermediate and advanced bowl skiing opportunities during the early and late season and greatly improve skier distribution throughout the ski season. It has high elevation, north-facing, gladed and open bowls and is not expected to significantly increase the number of skiers on peak days, consistent with the trends over the last 5 years. The Category III

approval process with the United States Forest Service began in 1984. Through the public scoping process, there have been five public hearings hosted by the USFS and Vail Associates and numerous other public sessions, discussions and tours. Two of the five sessions were presented at Town Council public hearings. The town infrastructure issues raised through the public input process have been intensely studied over the last two years and addressed through the agreement.

The agreement provides for the creation of an assessment committee (made up of representatives of TOV and VA) which, through an extensive monitoring program, will consider the effects and impacts of the non-peak and peak period programs. The monitoring program will include demographic profiles of skiers, traffic and parking analysis, nonpeak marketing analysis, hotel occupancy assessment, service level ratings and more. The Assessment Committee will provide general advice regarding methods, as described in the agreement, in which the community can maintain and preserve its position as a premier resort. Constant re-evaluation will be a key part of the committee's work, gaining input from the community and via the Town Council to assure that the goals of the agreement are reached as we move forward. TOV and VA have also agreed to jointly appoint a broad-based community task force by September 1, 1995, to explore additional mechanisms to better utilize existing resources during the nonpeak periods. This task force will report on a semi-annual basis to the Assessment Committee.

TRANSPORTATION AND CIRCULATION

Transportation and circulation are critical to managing peak and non-peak periods, as the number of skiers attracted to the mountain directly affects the traffic conditions during the day. However, other circumstances in town (weather, commuters, special events) not directly related to on-mountain activities affect transportation and circulation. TOV and VA have developed methods to reduce the likelihood of traffic congestion through the following programs:

- The lift ticket tax has been in existence in Vail since 1966. The lift ticket tax demonstrates a partnership unique in the ski industry and has enabled TOV to provide such transportation amenities as its free bus service. In 1994, lift ticket tax revenues were approximately \$2 million. TOV and VA acknowledge that alternative future transportation and circulation needs are substantial. Accordingly, other local, state and federal revenues will be required to supplement lift tax revenues. TOV and VA agree that as the creation of additional lift tax revenues, transportation grants and other revenue sources allow transportation revenues to exceed in any given year the cost associated with TOV's bus services, such supplemental revenues will be available for use by TOV for other priority transportation and circulation needs.
- TOV construction of roundabouts or similar alternatives to the Main Vail four-way stop will facilitate the flow of traffic to and from town. VA has pledged \$500,000 toward this project. VA will also cooperate to make the project more cost effective by working collectively with TOV and/or providing independent services on a not-for-profit basis to assist in portions of the project. This contribution represents VA's commitment toward solving what research has identified as the main traffic and circulation problem in Vail.
- Vail Associates has agreed to assist the Town in obtaining state and federal funding for the West Vail roundabout.
- Golden Peak improvements will provide a more viable portal to the mountain. TOV supports Vail Associates' conceptual ideas which include improved circulation of

pedestrian and vehicular traffic which will be part of the Golden Peak redevelopment and which will benefit the community and guests. The joint efforts by VA and TOV will facilitate achieving the goals presented in the Streetscape Plan, Vail Village Master Plan and Transportation Master Plan.

- Vail Associates and Town of Vail agree that if any future efforts by Vail Associates to modify its USFS permit on Vail Mountain result in increasing the allowable SAOT (skiers at one time), Vail Associates will participate on a fair and equitable basis in the addition of needed parking structures. At the same time, the Town of Vail will continue to improve the efficient use of existing winter parking situation through aggressive management techniques.
- VA and TOV will actively pursue park and ride sites for their employees and employees of the community. As part of this effort, TOV and VA will develop cooperative relationships with public and private institutions to utilize appropriate parking sites which are available.
- VA supports all efforts toward the consolidation of the various bus and other transportation systems into a regional transportation authority. VA will use its best efforts to cause the Beaver Creek Resort Company to continue to make appropriate contribution.

HOUSING

Affordable housing is an issue in all Colorado resort towns. TOV and VA are committed to maintaining and expanding resident housing particularly within the Town of Vail. TOV and VA have begun or are pursuing the following programs:

VA Initiatives

- Currently provides over 650 affordable housing spaces for its employees in Lake Creek Villas, Eagle Bend, Eagle Bend III, The Tarnes, Timber Ridge and Sunbird Lodge (275 within the Town of Vail)
- Participation with other public and private groups in the development of Lake Creek Villas, Eagle Bend and Eagle Bend III
- Development of second-mortgage program to promote first-home purchases by employees
- VA commitment to participate in the Vail Commons development similar to VA's participation in Eagle Bend in Avon

TOV Initiatives

- Goal is to create permanent deed restricted quality units for residents and employees
- Vail Housing Authority, formed in 1991, to assist in exploring available options for employee housing
- Employee housing ordinance, established in 1992, providing incentives for the creation of units ranging from 300 to 1,200 square feet. As a result, as of February 1995, 29 units have been created and another 66 approved.
- Purchase of Vail Commons site in 1993, with construction anticipated in 1996, for future affordable housing location (minimum of 60 units) with a mixed use.
- Approval of \$300,000 grant from Colorado Department of Local Affairs to be used for public improvements associated with a housing development (Vail Commons)
- Implementation of Mortgage Guarantee Program

- Four lots adjacent to Town Manager's residence in West Vail are under review as potential deed restricted home sites.
- Public Works facility master plan identifies several employee housing units to be constructed on town-owned property.

OPEN SPACE

As demonstrated by recent community surveys, the residents of Vail feel strongly about the preservation of open space. VA has agreed to deed to TOV several parcels of green space and stream tract land that will remain permanent open space within the Town of Vail.

LONG-RANGE CAPITAL PLANNING

Realizing that capital improvements on the mountain or in town have far-reaching effects, TOV and VA have tried to coordinate their goals in order to maximize the benefits of each project. Emphasis is placed on developing capital projects that will help address the above issues. Nonetheless, these plans may change due to the development of new priorities.

The main emphasis of Vail Associates' tentative five year capital plan is to continue to ensure the reputation of Vail Mountain as a reliable quality skiing experience. The planning is three fold: to improve the efficiency of base area and mountain circulation, to improve the quality of service amenities on the mountain and to secure reliable and consistent snow conditions and skiing experience during the early, middle and late seasons.

VA proposed capital projects, 1995 - 1999:

- The replacement of Chairs 3, 6, and 10 with high speed quads.
- The proposed redevelopment of the Golden Peak base area, designed to alleviate the pressures currently experienced.
- Subject to Forest Service approvals, the construction of the lifts and trails in Category III.
- The improvement of on-mountain dining at Mid Vail
- The Eagle's Nest redevelopment, including the replacement of the gondola with a high speed gondola and the potential redevelopment of the Lionhead gondola building.
- Water augmentation, allowing VA to begin a three year snowmaking expansion to guarantee early season skiing.
- The plan for numerous smaller projects to supplement the above mentioned list.

The Town of Vail's five year capital program attempts to address needs at the neighborhood level in addition to a number of large-scale improvements town-wide to maintain Vail's resort quality. In addition, the Real Estate Transfer Tax is used as a separate fund for purchasing and improving open space as well as building and maintaining bike paths.

TOV proposed capital projects, 1995 - 1999:

- Construction of the main Vail roundabout or similar alternative. This project will reduce delays at the main Vail 4-way stop and will significantly increase the carrying capacity of the intersection. It will also improve the aesthetic and enhance the appearance of Vail's 'front door'.
- The renovation of the Covered Bridge. Portions of the bridge suffering from decay will be replaced. Rock abutments and new lighting will help improve the appearance of this area.

- Purchase of eight low-floor busses for use on the in-town shuttle. The low-floor buses will reduce loading time and significantly increase the capacity of the in-town system. Additional busses will replace existing buses on the Town of Vail system.
- Replacement of the Pulis Bridge (golf course entrance). This bridge is functionally obsolete and will be replaced with a new, wider bridge.
- Complete reconstruction of streets in Matterhorn, Lionsridge, Golf Course and East Vail.
- Consideration and revision of Land Use Plan and Master Plan and Design Guidelines for the Lionshead area.
- Renovation of Public Works facility.
- Reconstruction of the East Lionshead bus stop. Emphasis will be placed on pedestrian safety and improvement of skier drop off as well as aesthetic improvements.
- Construction of improvements at the West Vail interchange.
- Consideration of Simba Run underpass.
- Construction of a fire station in the West Vail area.
- Remodel of the Vail Transportation Center.
- Improvements to streetscape, including addition of street lights in Vail Village and Lionshead.
- Improvement to landscaping on Gore Creek Drive in Vail Village.

CONCLUSION

The main objective of the agreement and the joint efforts of the Town and Vail Associates has been to create systems to better manage resort business growth issues in the community while protecting against over-utilization during busy times and under-utilization during less busy times in the ski season. Through this effort of balancing utilization, service needs can be predicted and addressed and employment opportunities can become more consistent. Town of Vail and Vail Associates recognize that their joint work does not address all of the issues facing the Vail community now and in the future, but feel that their joint efforts have opened up avenues for discussion and have established some attainable goals for the future. The participation of the business community, property owners and residents in pursuing these solutions is critical.

APPENDIX B

Plant Species List and Detailed Vegetation Impact Analyses for the Project Area

Plant Species List and Impacts to Vegetation

This appendix supports the discussion in the vegetation sections in chapters three and four. It provides a list in alphabetical order of woody and herbaceous plant species. It also compares impacts to vegetation by ski pod from the potential development of ski lifts, ski trails, roads, and skiways if either the Center Ridge, Proposed Action, or MDP alternatives would be implemented. The ski lifts considered are: Ridge Lift (RGE), Super Bowl Lift (SB), Super Bowl Long Lift (SBL), Tea Cup Lift (TCP), Pete's Bowl Lift (PTE), Commando Bowl Lift (CBL), Super Bowl West Lift (SBW), and Lower Sun Down Bowl Lift (LSL). Ski trails are either open (in natural open areas), conventional (some grading and up to 95 percent of woody vegetation cleared) or gladed (up to 33 percent of vegetation cleared). The location of these developments can be found on maps in the vegetation section in chapter four.

Table 1. Plant Species Identified in the Project Area			
Species Name	Common Name	Species Name	Common Name
Trees and Shrubs		<i>Seriphidium vaseyanun</i>	mountain sagebrush
<i>Abies lasiocarpa</i>	subalpine fir	<i>Symphoricarpos rotundifolius</i>	mountain snowberry
<i>Amelanchier alnifolia</i>	serviceberry	Forbs and Graminoids	
<i>Chrysothamnus parryi</i>	Parry rabbitbrush	<i>Achillea lanulosa</i>	yarrow
<i>Distegia involucrata</i>	bearberry honeysuckle	<i>Acomastylis rossii</i>	alpine avens
<i>Mahonia repens</i>	Oregon grape	<i>Aconitum columbianum</i>	monkshood
<i>Picea engelmannii</i>	Engelmann spruce	<i>Actaea rubra ssp. arguta</i>	baneberry
<i>Pinus contorta</i>	lodgepole pine	<i>Adenolinum lewisii</i>	blue flax
<i>Populus tremuloides</i>	quaking aspen	<i>Agastache urticifolia</i>	giant hyssop
<i>Ribes montigenum</i>	gooseberry currant	<i>Agoseris aurantiaca</i>	orange dandelion
<i>Ribes wolfii</i>	Rothrock currant	<i>Allium geyeri</i>	Geyer onion
<i>Rosa woodsii</i>	wood rose	<i>Allium spp.</i>	wild onion
<i>Rubus idaeus ssp. melanolasius</i>	red raspberry	<i>Amenoastrum narcissiflorum ssp. zephyrum</i>	narcissus anenome
<i>Salix arctica</i>	arctic willow	<i>Amerosedum lanceolatum</i>	yellow stonecrop
<i>Salix brachycarpa</i>	barren-ground willow	<i>Androsace septentrionalis</i>	rock jasmine
<i>Salix drummondii</i>	Drummond willow	<i>Anenome multifida ssp. globosa</i>	globeflower
<i>Salix geyeriana</i>	Geyer willow	<i>Angelica grayi</i>	Gray angelica
<i>Salix monticola</i>	mountain willow	<i>Antennaria spp.</i>	pussy-toes
<i>Salix planifolia</i>	plane-leaf willow	<i>Anticlea elegans</i>	mountain death camas
<i>Salix reticulata ssp. nivalis</i>	snow willow	<i>Aquilegia coerulea</i>	Colorado columbine
<i>Sambucus microbotrys</i>	elderberry		

Table 1. Continued

<i>Species Name</i>	<i>Common Name</i>	<i>Species Name</i>	<i>Common Name</i>
<i>Aquilegia elegantula</i>	elegant columbine	<i>Cirsium spp.</i>	thistle
<i>Arnica cordifolia</i>	heartleaf arnica	<i>Claytonia lanceolata</i>	spring beauty
<i>Arnica rydbergii</i>	Rydberg arnica	<i>Clementsia rhodantha</i>	Queens crown
<i>Aster foliaceus</i>	leafy aster	<i>Collinsia parviflora</i>	blue-eyed Mary
<i>Bistorta bistortoides</i>	American bistort	<i>Danthonia intermedia</i>	oatgrass
<i>Boechera drummondii</i>	false arabis	<i>Delphinium barbeyi</i>	Barbey larkspur
<i>Bromopsis canadensis</i>	Canada brome	<i>Delphinium nuttallianum</i>	Nuttall larkspur
<i>Bromopsis pumpehiana</i>	fringed brome	<i>Deschampsia cespitosa</i>	tufted hairgrass
<i>Calamagrostis canadensis</i>	Canada reedgrass	<i>Dodecatheon pulchellum</i>	shooting star
<i>Campanula rotundifolia</i>	Scotch harebell	<i>Draba albertina</i>	draba
<i>Cardamine cordifolia</i>	heartleaf bittercress	<i>Draba aurea</i>	yellow draba
<i>Carex aquatilis</i>	water sedge	<i>Draba streptocarpa</i>	twisted draba
<i>Carex foenea</i>	dry-spike sedge	<i>Dracocephalum parviflorum</i>	dragonhead
<i>Carex geyeri</i>	elk sedge	<i>Dugaldia hoopesii</i>	orange sneezeweed
<i>Carex lasiocarpa</i>	wooly-fruit sedge	<i>Elymus trachycaulus</i>	slender wheatgrass
<i>Carex phaeocephala</i>	dunhead sedge	<i>Elytrigia dasystachya</i>	thickspike wheatgrass
<i>Carex retrorsa</i>	retorse sedge	<i>Elytrigia spp.</i>	wheatgrass
<i>Carex rupestris</i>	curly sedge	<i>Epilobium hornemannii</i>	Hornemann willowherb
<i>Carex spp.</i>	sedge	<i>Equisetum arvense</i>	field horsetail
<i>Carex utriculata</i>	beaked sedge	<i>Eremogene congesta</i>	congested sandwort
<i>Castilleja haydenii</i>	Hayden paintbrush	<i>Eremogene fendleri</i>	Fendler sandwort
<i>Castilleja miniata</i>	scarlet paintbrush	<i>Erigeron melanocephalus</i>	black-headed daisy
<i>Castilleja occidentalis</i>	western paintbrush	<i>Erigeron elatior</i>	tall daisy
<i>Castilleja rhexifolia</i>	rhexia-leaved paintbrush	<i>Erigeron leiomerus</i>	smooth daisy
<i>Castilleja sulphurea</i>	yellow paintbrush	<i>Erigeron peregrinus</i>	strange daisy
<i>Cerastium strictum</i>	mouse ear	<i>Erigeron simplex</i>	one-flowered daisy
<i>Chamerion danielsii</i>	fireweed	<i>Erigeron speciosus</i>	Oregon daisy
<i>Chionophila jamesii</i>	snowlover	<i>Erigeron spp.</i>	daisy
<i>Ciliaria austromontana</i>	spotted saxifrage	<i>Eriogonum umbellatum</i>	yellow buckwheat

Table 1. Continued

<i>Species Name</i>	<i>Common Name</i>	<i>Species Name</i>	<i>Common Name</i>
<i>Erysimum capitatum</i>	Western wallflower	<i>Ligusticum porteri</i>	Porter lovage
<i>Erythronium grandiflorum</i>	glacier lily	<i>Limnorchis dilata ssp. albiflora</i>	white bog-orchid
<i>Festuca brachyphylla</i>	small-leaved fescue	<i>Linaria vulgaris</i>	toadflax
<i>Festuca thurberi</i>	Thurber fescue	<i>Linnaea borealis</i>	twinflower
<i>Fragaria virginiana ssp. glauca</i>	mountain strawberry	<i>Listera cordata ssp. nephrophylla</i>	heartleaf twayblade
<i>Frasera speciosa</i>	monument plant	<i>Lithophragma glabrum</i>	fringed woodlandstar
<i>Galium septentrionale</i>	northern bedstraw	<i>Lloydia serotina</i>	alp lily
<i>Galium trifidum ssp. brevipes</i>	small bedstraw	<i>Lupinus argenteus</i>	silver lupine
<i>Gentianella acuta</i>	little gentian	<i>Luzula parviflora</i>	millet woodrush
<i>Gentianiodes algida</i>	arctic gentian	<i>Luzula spicata</i>	spike woodrush
<i>Gentianopsis barbellata</i>	barbellate gentian	<i>Mertensia ciliata</i>	streamside bluebells
<i>Gentianopsis thermalis</i>	fringed gentian	<i>Mertensia lanceolata</i>	lanceleaf bluebells
<i>Geranium richardsonii</i>	Richardson geranium	<i>Micranthes odontoloma</i>	brook saxifrage
<i>Goodyera oblongifolia</i>	rattlesnake plantain	<i>Micranthes rhomboidea</i>	snowball saxifrage
<i>Hackelia floribunda</i>	stickseed	<i>Mimulus tilingii</i>	monkey flower
<i>Heracleum sphondylium ssp. montanum</i>	cow parsnip	<i>Mitella pentandra</i>	fivestar miterwort
<i>Heterotheca villosa</i>	hairy goldenaster	<i>Mitella stauropetala var. stenopetala</i>	smallflower miterwort
<i>Heuchera parviflora</i>	alumroot	<i>Monarda fistulosa</i>	horse-mint
<i>Hydrophyllum capitatum</i>	capitate waterleaf	<i>Moneses uniflora</i>	one-flowered wintergreen
<i>Hydrophyllum fendleri</i>	Fendler waterleaf	<i>Noccacea montana</i>	candytuft
<i>Ipomopsis aggregata</i>	scarlet gilia	<i>Orthophila secunda</i>	one-sided wintergreen
<i>Juncus arcticus</i>	wiregrass rush	<i>Osmorrhiza depauperata</i>	blunt fruit sweet-cicely
<i>Juncus drummondiana</i>	Drummond rush	<i>Osmorrhiza occidentalis</i>	western sweet anise
<i>Juncus longistylis</i>	longstyle rush	<i>Oxypolis fendleri</i>	Fendler cowbane
<i>Juniperus communis</i>	common juniper	<i>Packera dimorphophylla</i>	groundsel
<i>Lathyrus leucanthus</i>	peavine	<i>Parnassia fimbriata</i>	grass-of-parnassus
<i>Lathyrus spp.</i>	peavine	<i>Paxistima myrsinites</i>	mountain lover
<i>Ligularia amplexans</i>	alpine groundsel	<i>Pedicularis groenlandica</i>	elephanthead

Table 1. Continued

<i>Species Name</i>	<i>Common Name</i>	<i>Species Name</i>	<i>Common Name</i>
<i>Pedicularis parryi</i>	Parry lousewort	<i>Senecio triangularis</i>	arrowleaf groundsel
<i>Pedicularis procera</i>	Gray lousewort	<i>Senerio atratus</i>	black groundsel
<i>Pedicularis racemosa</i> ssp. <i>alba</i>	parrots beak	<i>Sibbaldia procumbens</i>	prostrate sibbaldia
<i>Penstemon harbourii</i>	Harbour penstemon	<i>Solidago multiradiata</i> ssp. <i>scopilorum</i>	low golden-rod
<i>Penstemon rydbergii</i>	Rydberg penstemon	<i>Sporobolus airoides</i>	dropseed grass
<i>Penstemon</i> spp.	penstemon	<i>Stellaria longifolia</i>	long-leaved starwort
<i>Penstemon whippleanus</i>	Whipple penstemon	<i>Stellaria longipes</i> ssp. <i>stricta</i>	long-stalk starwort
<i>Phleum commutatum</i>	alpine timothy	<i>Stellaria</i> spp.	chickweed
<i>Pneumonanthe parryi</i>	Parry bottle gentian	<i>Stipa lettermanii</i>	Letterman needlegrass
<i>Poa alpina</i>	alpine bluegrass	<i>Stipa nelsonii</i>	Nelson needlegrass
<i>Poa artica</i>	arctic bluegrass	<i>Streptopus fassettii</i>	twisted stalk
<i>Poa leptocoma</i>	bog bluegrass	<i>Swertia perennis</i>	star gentian
<i>Poa palustris</i>	fowl bluegrass	<i>Taraxacum officianale</i>	dandelion
<i>Poa</i> spp.	bluegrass	<i>Thalictrum fendleri</i>	Fendler meadow-rue
<i>Polemonium pulcherrimum</i> ssp. <i>delicatum</i>	subalpine Jacob ladder	<i>Trifolium parryi</i>	Parry clover
<i>Polemonium viscosum</i>	skypilot	<i>Trisetum spicatum</i>	spike trisetem
<i>Polygonum polygaloides</i> ssp. <i>kelloggii</i>	Kellogg knotweed	<i>Trollius albiflorus</i>	globoseflower
<i>Potentilla pulcherrima</i>	cinquefoil	<i>Vaccinium myrtillus</i> ssp. <i>oreophilum</i>	myrtle whortleberry
<i>Psychrophila leptosepala</i>	marsh marigold	<i>Vaccinium scoparium</i>	grouse whortleberry
<i>Pyrola chlorantha</i>	green wintergreen	<i>Valeriana capitata</i> ssp. <i>acutiloba</i>	cordilleran valerian
<i>Pyrola minor</i>	small wintergreen	<i>Veratrum tenuipetaluan</i>	cornhusk lily
<i>Ranunculus inamoeneus</i>	pleasant buttercup	<i>Veronica nutans</i>	speedwell
<i>Ranunculus macauleyi</i>	McCauley buttercup	<i>Veronicastrum serpyllifolium</i> ssp. <i>humifusum</i>	thyme-leaf speedwell
<i>Ranunculus</i> spp.	buttercup	<i>Vicia americana</i>	vetch
<i>Rhodiola integrifolia</i>	Kings crown	<i>Vida adunca</i>	blue violet
<i>Senecio fremontii</i>	Fremont groundsel	<i>Viola canadensis</i>	Canada violet
<i>Senecio integerrimus</i>	Columbia groundsel		
<i>Senecio serra</i>	saw groundsel		

Table 2. Detailed Impact Analysis for Proposed Development by Vegetation Type and Bowl

CENTER RIDGE ALTERNATIVE	ACRES IN PROJECT AREA	IMPACTS TO VEGETATION BY SKI TRAILS BY POD										ROADS & UTILITIES	TOTAL DISTURBED ACRES	PERCENT OF TYPE DISTURBED		
		Center Ridge					Super Bowl									
		Open-1	Conv-2	Glade-3	Open	Conv	Glade	Open	Conv	Glade						
Aspen/Conifer (AC)	219	0	9	6	0	0	0	0	2	0	1	21	9%			
Aspen (AS)	200	0	2	2	0	1	2	0	10	7	0	6	31	15%		
Grassland/Meadow (GM)	907	0	4	6	40	16	3	3	2	1	0	5	101	11%		
Lodgepole Forest (LP)	892	0	52	93	0	6	2	0	2	0	0	15	170	19%		
Lodgepole Savanna (LS)	102	0	0	1	9	3	0	0	0	0	0	0.23	1	4	18%	
Mountain Brush (MB)	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	
Mixed Spruce/Fir/Lodgepole Forest (MF)	488	0	0	1	0	5	1	0	0	0	0	0	0	0	0%	
Mixed Savanna	85	0	12	13	0	0.32	0.16	0	0	0	0.28	0.20	0	0.42	7	1%
Special Aquatic Site (SAS)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
Rock/Scree (SC)	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
Willow Riparian (WR)	76	0	0.02	0.03	0	0	0	0	0.03	0.32	0.10	0	0	0	0	0%
Spruce/Fir Savanna (SS)	223	0	0	0	6	2	4	0	0	0	0.01	0	1	1	2%	6%
Spruce/Fir (SF)	332	0	4	4	0	1	2	0	0	0	1	1	0	1	14	4%
Spruce/Fir (Old Growth)	697	0	0	0	0	0	13	27	0	0	0	1	0	2	42	6%
TOTALS	4300	0	85	125	55	47	41	3	14	9	6	7	8	445	10%	

PROPOSED ACTION ALTERNATIVE		Permit Area (acres)	IMPACTS TO VEGETATION BY SKI TRAILS BY POD														ROADS & UTILITIES	TOTAL DISTURBED ACRES	PERCENT OF TYPE DISTURBED					
			Center Ridge						Super Bowl				Pete's Bowl											
			Open-1		Conv-2		Glade-3		Open		Conv		Glade		Open					Conv		Glade		
Aspen/Conifer (AC)		219	0	9	0	0	0	0	0	0	4	5	0	2	0	2	0	1	3	33	15.19%			
Aspen (AS)		200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	31	15.24%		
Grassland/Meadow (GM)		907	0	4	0	6	40	16	3	36	0	8	3	2	1	0	5	1	5	13	144	15.88%		
Lodgepole Forest (LP)		892	0	56	0	90	0	8	2	0	12	48	0	0	0	2	0	3	0	25	243	27.23%		
Lodgepole Savanna (LS)		102	0	0	0	1	9	3	0	0	0	0	0	0	0	0	0.25	0	1	1	16	15.52%		
Mountain Brush (MB)		34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%		
Mixed Spruce/Fir/Lodgepole Forest (MF)		488	0	0	0	1	0	5	1	0	18	52	0	0	0	0	0	0	0	4	82	16.75%		
Mixed Savanna		85	0	13	12	0	0	32	0.16	0	0	0.23	0	0	0	0.28	0.20	0	0	0	27	31.25%		
Special Aquatic Site (SAS)		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%		
Rock/Scree (SC)		44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%		
Willow Riparian (WR)		76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2.63%	0	0.00%	
Spruce/Fir Savanna (SS)		223	0	0	0	0.02	0.03	0	0	0	0.08	4	0	0.03	0.32	0.10	0	0	0	6	7.88%	0	0.00%	
Spruce/Fir (SF)		332	0	0	0	0	6	2	4	35	13	17	0	0	0	0	0.01	1	0	3	83	37.31%	0	0.00%
Spruce/Fir (Old Growth)		697	0	4	0	4	0	1	2	0	20	28	0	0	0	1	0	0.07	0	9	69	20.93%	0	0.00%
TOTALS		4300	0	91	119	55	47	41	71	99	177	3	34	9	6	7	8	8	75	828	19.27%	0	0.00%	

MDP ALTERNATIVE		ACRES IN PROJECT AREA	IMPACTS TO VEGETATION BY SKI TRAILS BY POD																		ROADS & UTILITIES			TOTAL DISTURBED ACRES	PERCENT OF TYPE DISTURBED
			Commando Bowl						Super Bowl West			Teacup Bowl			IMPACTS FROM LIFTS IN EACH POD										
			Open-1	Conv-2	Glade-3	Open	Conv	Glade	Open	Conv	Glade	Open	Conv	Glade	Open	Conv	Glade	CBL	SBL	SBW	TCP	LSL			
Vegetation Type	Aspen/Conifer (AC)	219	0	4	5	0	9	6	0	6	3	0	2	0	0	1	0	1	0.14	1	0	5	53	24%	
	Aspen (AS)	200	0	0	0	0	3	4	0	0	0	0	10	7	0	0	0	0	0	0.46	1	7	32	16%	
	Grassland/Meadow (GM)	907	36	8	34	40	20	9	0	8	14	3	2	1	0	5	1	5	1	26	217	24%	24%		
	Lodgepole Forest (LP)	892	0	12	57	0	58	95	0	41	47	0	0	0	3	1	1	3	4	0.04	32	353	40%		
	Lodgepole Savannah (LS)	102	0	0	0.4	9	3	1	0	0	0	0	0	0	0	0	0	0	0	1	0.13	2	17	16%	
	Mountain Brush (MB)	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	15%	15%	
	Mixed Spruce/Fir/Lodgepole Forest (MF)	488	0	33	74	0	3	1	0	29	15	0	0	0	0	0	1	0	3	0	0	4	166	34%	
	Mixed Savannah (MS)	85	0	4	3	0	13	13	0	0	0	0	0	0	0	0	0	0	0	0	0	39	39%	39%	
	Rock/Aquatic Site (SAS)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	0%
	Rock/Scree (SC)	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	0%
	Willow Riparian (WR)	76	0	5	14	0	0.02	0.03	0	0.07	1	0	0	0	0	0	0.13	1	0.14	0	0	1	3%	3%	3%
	Spruce/Fir Savannah (SS)	223	35	30	32	6	2	4	0	0	0	0	9.03	0.32	0	0	0.01	0	0	0	0.06	3	23	31%	31%
	Spruce/Fir (SF)	332	0	33	46	0	5	6	0	0	0	0	0	0	0	0	1	0	0	0	0	5	115	52%	52%
	Spruce/Fir (Old Growth)	697	0	56	58	0	12	27	0	0	0	0	0	0	0	0	0	1	0	0	0	11	125	36%	36%
TOTALS		4300	71	184	324	55	131	166	0	84	103	3	14	9	0	4	18	9	10	8	3	116	1319	31%	31%

- 1 Open ski trails - in naturally open vegetation types
- 2 Conventional ski trails - up to 95% cleared and graded
- 3 Graded ski trails - up to 33% of the trees removed
- 4 RGB = Commando Bowl Lift
SB = Super Bowl Long Lift
TCP = Teacup Bowl West Lift
PTE = Pete's Bowl Lift

Table 3. Detailed Impact Analysis for Roads and Skiways by Vegetation Type

CENTER RIDGE ALTERNATIVE	Roads and Skiway Disturbance (acres)											
	I-T SW	SB SWR	RL SW	C SWR	WS SW	TC SWR	S2 SWR	S3 SWR	Total			
Vegetation Type	0.00	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.59			
Aspen/Conifer (AC)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04			
Aspen (AS)	0.06	0.01	2.49	2.39	0.63	1.24	0.52	7.67	15.01			
Grassland/Meadow (GM)	3.59	8.47	0.15	0.00	0.00	0.00	2.63	0.25	15.09			
Lodgepole Forest (LP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.01	4.01			
Lodgepole Savanah (LS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Mountain Brush (MB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Mixed Spruce/Fir/Lodgepole Forest (MFL)	0.00	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.42			
Mixed Savanah (MS)	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.39			
Special Aquatic Site (SAS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Rock/Scree (SC)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Willow Riparian (WR)	0.64	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.86			
Spruce/Fir Savanah (SS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Spruce/Fir (Total Spruce/Fir) (SFP)	0.00	0.00	0.92	0.00	0.00	0.00	0.00	0.00	0.92			
Spruce/Fir (Old Growth)	0.00	0.00	0.00	0.44	1.38	0.00	0.00	0.00	1.82			
Total	4.29	9.07	4.37	2.83	2.01	7.58	3.15	11.97	45.27			

PROPOSED ACTION ALTERNATIVE	Roads and Skiway Disturbance (acres)											
	I-T SW	SB SWR	RL SW	C SWR	WS SW	EP SW	PB SWR	PR SWR	UEP SW	TC SWR	S2 SWR	Total
Vegetation Type	0.00	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.17
Aspen/Conifer (AC)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.12
Aspen (AS)	0.06	0.01	2.49	2.39	0.63	0.00	1.49	2.10	0.40	0.52	0.01	12.74
Grassland/Meadow (GM)	3.59	8.47	0.15	0.00	0.00	4.96	3.43	0.00	0.00	2.63	0.00	24.60
Lodgepole Forest (LP)	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.00	1.13
Lodgepole Savanah (LS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mountain Brush (MB)	0.00	0.00	0.00	0.00	0.00	2.05	0.00	0.00	0.00	0.00	0.00	4.40
Mixed Spruce/Fir/Lodgepole Forest (MFL)	0.00	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39
Mixed Savanah (MS)	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Special Aquatic Site (SAS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rock/Scree (SC)	0.00	0.00	0.00	0.00	0.00	0.38	0.77	0.00	0.00	0.00	0.00	1.15
Willow Riparian (WR)	0.64	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.22	0.00	0.93
Spruce/Fir Savanah (SS)	0.00	0.00	0.00	0.00	0.00	0.00	2.45	0.05	0.00	0.00	0.00	2.63
Spruce/Fir (Total Spruce/Fir) (SFP)	0.00	0.00	0.92	0.00	0.00	1.89	3.05	0.77	0.00	0.00	0.00	8.52
Spruce/Fir (Old Growth)	0.00	0.00	0.00	0.44	1.38	0.00	4.16	1.96	0.91	0.00	0.00	8.85
Total	4.29	9.07	4.37	2.83	2.01	9.28	18.29	4.88	1.51	7.58	3.15	74.63

MASTER DEVELOPMENT PLAN ALTERNATIVE	Roads and Skiway Disturbance (acres)																				
	I-T SW	SB SWR	RL SW	C SWR	WS SW	EP SW	PB SWR	PR SWR	UEP SW	TC SWR	CBL SWR	SBWL SWR	LCTLR	L5B SWR	L5W SW	CH	S1 SWR	S2 SWR	RE SW	ROAD	Total
Vegetation Type	0.00	0.59	0.00	0.00	0.00	0.00	1.74	0.00	0.00	0.00	0.00	2.07	0.00	0.00	0.47	0.00	0.00	0.00	0.00	0.00	4.87
Aspen/Conifer (AC)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.12	0.00	0.00	0.00	1.07	0.00	0.00	0.00	0.00	0.00	7.19
Aspen (AS)	0.06	0.01	2.49	2.39	0.63	0.00	1.49	0.27	2.10	0.40	1.24	2.94	2.10	0.09	2.98	1.27	0.01	0.32	0.52	1.23	24.5
Grassland/Meadow (GM)	3.59	8.47	0.15	0.00	0.00	4.96	3.43	0.00	0.00	0.00	0.00	0.00	6.08	0.00	0.33	0.00	0.00	1.29	2.63	1.21	0.00
Lodgepole Forest (LP)	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30	0.00	0.00	0.00	0.00	0.00	2.43
Lodgepole Savannah (LS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mountain Brush (MB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mixed Spruce/Fir/Lodgepole Forest (MF)	0.00	0.00	0.42	0.00	0.00	2.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.93	0.00	4.40
Mixed Savannah (MS)	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39
Special Aquatic Site (SAS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rock/Scree (SC)	0.00	0.00	0.00	0.00	0.00	0.38	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15
Willow Riparian (WR)	0.64	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.17	0.00	0.02	0.00	0.57	2.61
Spruce/Fir Savannah (SS)	0.00	0.00	0.00	0.00	0.00	0.00	2.45	0.14	0.05	0.00	0.00	2.13	0.01	0.00	0.00	0.00	0.00	0.00	0.13	0.00	5.27
Spruce/Fir (Total Spruce/Fir) (SFP)	0.00	0.00	0.92	0.00	0.00	1.89	3.05	0.46	0.77	0.00	0.00	1.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.89	0.00
Spruce/Fir (Old Growth)	0.00	0.00	0.00	0.44	1.38	0.00	4.16	1.96	0.91	0.00	0.00	6.32	3.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
total	4.29	9.07	4.37	2.83	2.01	9.28	18.29	4.88	1.31	7.58	1.12	6.36	11.17	0.69	5.68	1.91	0.01	1.63	3.15	6.39	3.02

APPENDIX C

Existing Wetland Acreage and Detailed Wetland Impact Analysis Tables

This appendix provides a detailed analysis of existing wetlands in the Project Area and potential impacts to those wetlands in the case that either the Center Ridge, Proposed Action, or MDP alternative is implemented. The information provided in this appendix supports the discussion in the wetlands sections in chapters three and four. The first series of tables list the existing wetlands by acres along Two Elk Creek and in Commando Bowl, East Pete's Bowl, Pete's Bowl, Super Bowl, Super Bowl West, Lower Sun Down Bowl, and Tea Cup Bowl. The second series of tables list potential impacted wetlands by acres under each action alternative for each area, as appropriate. The listed wetlands are located on maps in the wetlands section in chapter three.

Table C.1 Existing Two Elk Creek Wetlands (acres)						
ID #	Seep/Forested Wetland Complex (f)	Riparian Wetlands (r)	Subirrigated Wetland Meadow (m)	Channel (c)	Seep/Spring Complex (s)	Snowbed Complex
TEm1			0.07			
TEm2			0.51			
TEc3				0.01		
TEc4				0.01		
TEc5				0.09		
TEm6			2.51			
TEr7		10.76				
TEc8				0.01		
Tes9					0.19	
TEs10					0.03	
TEr11		9.56				
TEc12				0.03		
TEs13					0.01	
TEs14					0.04	
TEc15				0.03		
TEr16		2.98				
TEs17					0.00	
TEr18		1.12				
TEc19				0.16		
TEc20				0.01		
TEr21		0.17				
TEm22			0.09			
TEr23		0.32				

ID #	Seep/Forested Wetland Complex (f)	Riparian Wetlands (r)	Subirrigated Wetland Meadow (m)	Channel (c)	Seep/Spring Complex (s)	Snowbed Complex
TEr24		0.17				
TEr25		0.07				
TOTAL	0.00	25.15	3.18	0.35	0.27	0.00
Total acreage for the Two Elk Creek Complex				28.95		

Table C.2 Existing Commando Bowl Wetlands (acres)						
ID #	Seep/Forested Wetland Complex (f)	Riparian Wetlands (r)	Subirrigated Wetland Meadow (m)	Channel (c)	Seep/Spring Complex (s)	Snowbed Complex
CBf1	130.31					
CBm2			0.06			
CBc3				0.11		
CBm4			0.00			
CBm5			0.00			
CBm6			0.00			
Cbc7				0.04		
CBc8				0.05		
Cbr9		0.00				
CBs10					0.11	
CBs11					0.00	
CBs12					0.00	
CBs13					0.00	
CBs14					0.00	
CBc15				0.00		
TOTAL	130.31	0.00	0.06	0.20	0.11	0.00
Total wetland acreage for the Commando Bowl Complex				130.68		

Table C.3 Existing East Pete's Bowl Wetlands (acres)						
ID #	Seep/Forested Wetland Complex (f)	Riparian Wetlands (r)	Subirrigated Wetland Meadow (m)	Channel (c)	Seep/Spring Complex (s)	Snowbed Complex
EPb1						8.12
Epf2	9.80					
Epr3		1.65				

ID #	Seep/Forested Wetland Complex (f)	Riparian Wetlands (r)	Subirrigated Wetland Meadow (m)	Channel (c)	Seep/Spring Complex (s)	Snowbed Complex
Epr4		0.44				
EPs5					0.07	
EPs6					0.08	
EPs7					0.04	
EPc8				0.14		
EPs9					0.15	
EPs10					0.07	
EPs11					0.06	
EPs12					0.03	
EPm13			0.06			
EPc14				0.03		
EPs15				0.02		
Epf16	2.74					
EPr17		0.41				
TOTAL	12.54	2.50	0.06	0.19	0.50	0.50
Total wetland acreage for the East Pete's Bowl Complex				16.29		

Table C.4 Existing Pete's Bowl Wetlands (acres)						
ID #	Seep/Forested Wetland Complex (f)	Riparian Wetlands (r)	Subirrigated Wetland Meadow (m)	Channel (c)	Seep/Spring Complex (s)	Snowbed Complex
Pbb1						7.86
PBf2	0.10					
PBf3	0.26					
PBs4					0.04	
PBs5					0.09	
PBm6			0.13			
PBc7				0.11		
PBf8			0.26			
PBc9				0.09		
PBs10					0.12	
PBr11		0.12				

ID #	Seep/Forested Wetland Complex (f)	Riparian Wetlands (r)	Subirrigated Wetland Meadow (m)	Channel (c)	Seep/Spring Complex (s)	Snowbed Complex
PBs12					0.04	
PBr13		0.09				
PBr14		0.15				
PBm15			0.20			
PBc16				0.01		
PBr17		0.23				
PBr18		0.08				
PBf19	0.47					
PBs20					0.04	
PBr21		0.07				
PBf22	0.72					
PBr23		0.29				
PBr24		0.66				
PBs25					0.10	
PBs26					0.40	
PBr27		0.05				
PBs28					0.11	
PBc29				0.07		
PBr30				0.52		
PBc31				0.21		
PBs32				0.27		
PBr33				0.11		
PBr34		1.00				
PBr35		0.06				
PBr36		0.07				
PBr37		0.03				
TOTAL	1.55	2.90	0.59	1.39	0.94	7.86
Total wetland acreage for the Pete's Bowl Complex				15.23		

Table C.5 Existing Super Bowl Wetlands (acres)						
ID #	Seep/Forested Wetland Complex (f)	Riparian Wetlands (r)	Subirrigated Wetland Meadow (m)	Channel (c)	Seep/Spring Complex (s)	Snowbed Complex
SBm1			0.24			
SBr2		0.01				
SBs3					0.01	
SBr4		0.09				
SBc5				0.01		
SBs6					0.01	
SBr7		0.05				
SBc8				0.04		
SBc9				0.03		
SBs10					0.02	
SBs11					0.06	
SBs12					0.03	
SBc13				0.09		
SBr14		0.35				
SBr15		0.13				
SBr16		0.12				
SBs17					0.05	
SBs18					0.04	
SBs19					0.02	
SBr20		0.17				
SBs21					0.01	
SBs22					0.01	
SBs23					0.24	
SBs24					0.02	
SBs25					0.01	
SBs26					0.05	
SBs27					0.04	
SBr28		0.09				
SBs29					0.02	
SBr30		0.09				
SBs31					0.01	
SBs32					0.05	
SBc33				0.03		
SBm34			0.05			

ID #	Seep/Forested Wetland Complex (f)	Riparian Wetlands (r)	Subirrigated Wetland Meadow (m)	Channel (c)	Seep/Spring Complex (s)	Snowbed Complex
SBs35					0.02	
SBr36		0.10				
SBs37					0.02	
SBs38					0.01	
SBs39					0.08	
SBs40					0.01	
SBc41				0.02		
SBs42					0.07	
SBr43		1.10				
SBr44		0.25				
TOTAL	0.00	2.55	0.29	0.22	0.90	0.00
Total wetland acreage for the Super Bowl Complex				3.96		

Table C.6 Existing Super Bowl West Wetlands (acres)						
ID #	Seep/Forested Wetland Complex (f)	Riparian Wetlands (r)	Subirrigated Wetland Meadow (m)	Channel (c)	Seep/Spring Complex (s)	Snowbed Complex
SWs1					0.11	
SWr2		0.42				
SWs3					0.04	
SWs4					0.06	
SWs5					0.05	
SWs6					0.91	
SWs7					0.01	
SWc8				0.04		
SWs9					0.05	
SWs10					0.01	
SWs11					0.09	
SWs12					0.01	
SWr13		0.22				
TOTAL	0.00	0.64	0.00	0.04	1.34	0.00
Total wetland acreage for the Super Bowl West complex				2.02		

Table C.7 Existing Lower Sun Down Bowl Wetlands (acres)						
ID #	Seep/Forested Wetland Complex (f)	Riparian Wetlands (r)	Subirrigated Wetland Meadow (m)	Channel (c)	Seep/Spring Complex (s)	Snowbed Complex
LScl				0.13		
LSr2		0.21				
LSr3		4.63				
LSs4					0.05	
LSm5			1.01			
LSm6			0.89			
TOTAL	0.00	4.84	1.90	0.13	0.05	0.00
Total wetland acreage for the Lower Sundown Bowl Complex				6.92		

Table C.8 Existing Tea Cup Bowl Wetlands (acres)						
ID #	Seep/Forested Wetland Complex (f)	Riparian Wetlands (r)	Subirrigated Wetland Meadow (m)	Channel (c)	Seep/Spring Complex (s)	Snowbed Complex
TBcl				0.04		
TBc2				0.03		
TBc3				0.02		
TBc4				0.03		
TBc5				0.02		
TBs6					0.05	
TBr7		1.40				
TOTAL	0.00	1.40	0.00	0.14	0.05	0.00
Total wetland acreage for the Teacup Bowl Complex				1.59		

Table C.9 Wetland Impact Table for the Center Ridge Alternative				
Two Elk Creek Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
TEr11	Big Bridge	Bridge	.021	
TEr11	IT SW	Skiway	.21	
TEr11	Lower Bridge	Bridge	.034	
TEr11	TC SWR	Skiway-road	.014	
TEc12	1E	Ski Trail (G)	0	.042

ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
TEr16	SB SWR	Skiway-road	.028	
TEs17	TC SWR	Skiway-road	.008	
TEr25	IT SW	Skiway	.001	
Disturbance Subtotal for Two Elk Creek wetlands			0.316	.042
Super Bowl Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
SBc8	2H	Ski Trail (C)		.010
SBc9	2E	Ski Trail (G/O)		.007
SBc9	2H	Ski Trail (C)		.010
SBr11	2D	Ski Trail (G/O)		.062
SBr14	2B	Ski Trail (G)		.046
SBs14	2C	Ski Trail (G/O)		.052
Disturbance Subtotal for Super Bowl wetlands			0	0.187
Tea Cup Bowl Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
TBr7	4C	Ski Trail (G)		.27
TBr7	4D	Ski Trail (G)		.069
TBr7	TC SWR	Skiway-road	.022	0
Disturbance Subtotals for Teacup Bowl wetlands			0.022	0.339
Total Wetland Disturbance for the Center Ridge Alternative			0.338	0.57

Table C.10 Wetland Impact Table for the Proposed Action Alternative

East Pete's Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
EPb1	UEP SW	Skiway	0	.050
EPf2	3A	Ski Trail (C)	1.45	0
EPf2	3B	Ski Trail (C)	1.19	0

ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
EPf2	3B'	Ski Trail (G)	.051	0
EPr3	3A'	Ski Trail (G)	0	.057
EPr4	EPSW	Skiway	0	.016
EPs11	3C	Ski Trail (G/O)	0	.020
EPs12	3C	Ski Trail (G/O)	0	.028
EPc14	3C	Ski Trail (G/O)	0	.049
EPm13	3C'	Ski Trail (G)	0	.063
Disturbance Subtotals for East Pete's wetlands			2.691	0.283
Two Elk Creek Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
TEm6	3A'	Ski Trail (G)	0	.81
TEr7	3A'	Ski Trail (G)	0	.82
TEr7	3C	Ski Trail (G/O)	0	.34
TEr7	Upper Bridge	Bridge	.014	0
TEr11	Big Bridge	Bridge	.021	0
TEr11	IT SW	Skiway	.21	0
TEr11	Lower Bridge	Bridge	.034	0
TEr11	TC SWR	Skiway-road	.014	0
TEc12	1E'	Ski Trail (G)	0	.042
TEr16	SB SWR	Skiway-road	.028	0
TEs17	TC SWR	Skiway-road	.008	0
TEr25	IT SW	Skiway	.001	0
Disturbance Subtotal for Two Elk Creek wetlands			0.33	2.012
Pete's Bowl Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
PBf3	PB SWR	Skiway-road	.019	0
PBr11	RE SW	Skiway	0	.007
PBr17	RE SW	Skiway	0	.007

ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
PBf22	RE SW	Skiway	0	.10
PBr23	RE SW	Skiway	0	.01
PBr24	RE SW	Skiway	0	.02
PBf26	3O	Ski Trail (G)	0	.066
PBr27	RE SW	Skiway	0	.007
PBs28	3K	Ski Trail (C/O)	0	.47
PBc29	3I	Ski Trail (G)	0	.023
PBc29	PB SWR	Skiway-road	.005	0
PBc29	3J	Ski Trail (G)	0	.023
PBr30	3O	Ski Trail (G)	0	.084
PBc31	3O	Ski Trail (G)	0	.046
Disturbance Subtotal for Pete's Bowl wetlands			0.024	0.863
Super Bowl Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
SBc8	2H	Ski Trail (C)	0	.010
SBc9	2E	Ski Trail (G)	0	.007
SBc9	2H	Ski Trail (C)	0	.010
SBr11	2D	Ski Trail (G)	0	.062
SBr14	2B	Ski Trail (G/O)	0	.046
SBr14	2C	Ski Trail (G/O)	0	.052
Disturbance Subtotal for Super Bowl wetlands			0	0.187
Tea Cup Bowl Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
TBr7	4C	Ski Trail (G)	0	.27
TBr7	4D	Ski Trail (G)	0	.069
TBr7	TC SWR	Skiway-road	.022	0
Disturbance Subtotals for Teacup Bowl wetlands			0.022	0.339
Total Wetland Disturbance for the Proposed Action			3.07	3.68

Table C.11 Wetland Impact Table for the Master Development Plan

Commando Bowl Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
CBf1	CBA	Ski Trail (G)	.95	0
CBf1	CBB	Ski Trail (C)	8.89	0
CBf1	CBD	Ski Trail (G)	.10	0
CBf1	CBC	Ski Trail (G)	.80	0
CBm5	CBD	Ski Trail (G)	0	.12
CBr9	CBD	Ski Trail (G)	0	.069
CBr9	CBC	Ski Trail (G)	.29	0
CBs13	CBC	Ski Trail (G)	.14	0
Disturbance Subtotals for Commando Bowl wetlands			11.17	0.189
East Pete's Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
EPb1	UEP SW	Skiway	0	.050
EPb1	CBK	Ski Trail (C)	2.3	0
EPb1	CBG	Ski Trail (C)	.56	0
EPf2	CBL SWR	Skiway-road	.49	0
EPf2	3A	Ski Trail (C)	1.45	0
EPf2	3B	Ski Trail (C)	1.19	0
EPf2	3B'	Ski Trail (G)	.051	0
EPr3	CBJ	Ski Trail (G)	0	.12
EPr3	CBI	Ski Trail (G)	0	.27
EPr3	3A'	Ski Trail (G)	0	.057
EPr3	CBL SWR	Skiway-road	.07	0
EPr3	CBH'	Ski Trail (C)	0	.057
EPr4	EP SW	Skiway	0	.016
EPs5	CBI	Ski Trail (G)	0	.07
EPc8	CBI	Ski Trail (G)	0	.023

ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
EPs9	CBI	Ski Trail (G)	0	.15
EPs10	CBI	Ski Trail (G)	0	.068
EPs11	3C	Ski Trail (G)	0	.020
EPs12	3C	Ski Trail (G)	0	.028
EPm13	3C'	Ski Trail (G)	0	.063
EPc14	3C	Ski Trail (G)	0	.049
EPs15	CBI	Ski Trail (G)	0	.024
EPr17	CBL SWR	Skiway-road	.14	0
Disturbance Subtotals for East Pete's wetlands			6.251	1.065
Two Elk Creek Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
TEm6	CBH'	Ski Trail (C)	0	.84
TEr7	3A'	Ski Trail (G)	0	.82
TEr7	3C	Ski Trail (G)	0	.34
TEr7	Upper Bridge	Bridge	.014	0
TEr7	CBC	Ski Trail (G)	.93	0
TEr7	CBG	Ski Trail (C)	1.41	0
TEr7	CBH'	Ski Trail (C)	0	1.72
TEr11	Big Bridge	Bridge	.021	0
TEr11	IT SW	Skiway	.21	0
TEr11	Lower Bridge	Bridge	.034	0
TEr11	TC SWR	Skiway-road	.014	0
TEc12	1E'	Ski Trail (G)	0	.042
TEr16	SB SWR	Skiway-road	.028	0
TEs17	TC SWR	Skiway-road	.008	0
TEc20	CBC	Ski Trail (G)	0	.009
TEr25	IT SW	Skiway	.001	0
Disturbance Subtotal for Two Elk Creek wetlands			2.67	3.771

ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
Pete's Bowl Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
PBf3	PB SWR	Skiway-road	.019	0
PBr11	RE SW	Skiway	0	.007
PBr17	RE SW	Skiway	0	.007
PBf22	RE SW	Skiway	0	.10
PBr23	RE SW	Skiway	0	.01
PBr24	RE SW	Skiway	0	.02
PBf26	3O	Ski Trail (G)	0	.066
PBr27	RE SW	Skiway	0	.007
PBs28	3K	Ski Trail (C/O)	0	.47
PBc29	3I	Ski Trail (G)	0	.023
PBc29	PB SWR	Skiway-road	.005	0
PBc29	3J	Ski Trail (G)	0	.023
PBr30	3O	Ski Trail (G)	0	.084
PBc31	3O	Ski Trail (G)	0	.046
Disturbance Subtotal for Pete's Bowl wetlands			0.024	0.863
Super Bowl Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
SBc8	2H	Ski Trail (C)	0	.010
SBc9	2E	Ski Trail (G)	0	.007
SBc9	2H	Ski Trail (C)	0	.010
SBr11	2D	Ski Trail (G)	0	.062
SBr14	2B	Ski Trail (G/O)	0	.046
SBs14	2C	Ski Trail (G/O)	0	.052
SBr15	SBB	Ski Trail (G)	0	.046
SBr15	SBC	Ski Trail (C)	0	.20
SBr15	SBWL SWR	Skiway-Road	.08	0

ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
SBS18	SBB	Ski Trail (G)	0	.037
SBS23	SBC	Ski Trail (C)	0	.67
SBr28	SBWL SWR	Skiway-Road	.007	0
SBc33	SBWL SWR	Skiway-Road	.001	0
SBr36	SBE'	Ski Trail (C)	0	.023
SBr36	SBWL SWR	Skiway-Road	.003	0
SBS38	SBWL SWR	Skiway-Road	.001	0
SBS39	SBWL SWR	Skiway-Road	.001	0
SBr43	SBZ	Ski Trail (G)	0	.046
Disturbance Subtotal for Super Bowl wetlands			0.093	1.209
Super Bowl West Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
SWs12	SBWL SWR	Skiway-Road	.001	0
SWr13	SBWL SWR	Skiway-Road	.007	0
Disturbance Subtotal for Super Bowl West wetlands			0.008	0
Lower Sundown Bowl Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
LSr2	L5W SW	Skiway	0	.020
LSr3	L5W SW	Skiway	0	.060
LSr3	L5E SWR	Skiway-Road	.38	0
LSr3	West Bridge	Bridge	.049	0
Disturbance Subtotal for Lower Sun Down Bowl wetlands			0.429	0.08
Teacup Bowl Wetland Impacts				
ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
TBr7	4C	Ski Trail (G)	0	.27

ID#	Disturbed by (Trail or Skiway ID#)	Type of Feature	Dredge & Fill Disturbance (ac)	Ski Over/Veg Trim Disturbance (ac)
TBr7	4D	Ski Trail (G)	0	.069
TBr7	TC SWR	Skiway-road	.022	0
Disturbance Subtotals for Tea Cup Bowl wetlands			0.022	0.339
Total Wetland Disturbance for the Master Development Plan			20.67	7.52

APPENDIX D

Frequency of Various Forest Block Sizes

This appendix provides further information concerning the forest blocks discussed in the biodiversity sections in chapters three and four. Table 1 shows the current frequency of occurrence of forest blocks of various sizes in the project area. This is the situation that would result from the implementation of the No Action Alternative. Tables 2, 3, and 4 show the expected frequency of occurrence of forest blocks of various sizes that would result from the implementation of the Center Ridge, Proposed Action, and MDP alternatives, respectively. The tables show the number of blocks and total acres for four different block sizes in each of six different forest types.

Table 1. Frequency of occurrence of various forested blocks on the existing project area.				
Habitat Type	Block Size (acres)	Number of Blocks	Average Acres	Total Acres
Aspen/ Conifer	0-5	10	2	24
	6-50	7	18	128
	51-200	1	67	67
	201-500	0	0	0
Aspen	0-5	7	2	17
	6-50	4	7	30
	51-200	1	153	153
	201-500	0	0	0
Lodgepole Pine	0-5	3	2	6
	6-50	5	16	78
	51-200	2	93	186
	201-500	2	311	622
Mixed Coniferous Forest	0-5	3	2	5
	6-50	4	17	67
	51-200	4	104	416
	201-500	0	0	0
Spruce-Fir	0-5	11	2	22
	6-50	7	15	106
	51-200	3	68	204
	201-500	0	0	0
Spruce-Fir Old Growth	0-5	1	2	2
	6-50	0	0	0
	51-200	0	0	0
	201-500	2	347	694

Table 2. Expected frequency of occurrence of various forested blocks on the project area resulting from the implementation of Alternative B- Center Ridge.

Habitat Type	Block Size	Number of Blocks	Average Acres	Total Acres
Aspen/ Conifer	0-5	30	2	24
	6-50	9	19	171
	51-200	0	0	0
	201-500	0	0	0
Aspen	0-5	32	1	45
	6-50	7	8	59
	51-200	1	96	96
	201-500	0	0	0
Lodgepole Pine	0-5	60	1	61
	6-50	29	13	377
	51-200	3	66	198
	201-500	1	255	255
Mixed Coniferous Forest	0-5	27	1	27
	6-50	14	11	158
	51-200	3	101	303
	201-500	0	0	0
Spruce-Fir	0-5	41	1	43
	6-50	13	18	232
	51-200	1	57	57
	201-500	0	0	0
Spruce-Fir Old Growth	0-5	14	2	24
	6-50	6	17	100
	51-200	2	126	252
	201-500	1	321	321

Table 3. Expected frequency of occurrence of various forested blocks on the project area resulting from the implementation of Alternative C- Proposed Action.

Habitat Type	Block Size	Number of Blocks	Average Acres	Total Acres
Aspen/ Conifer	0-5	35	1	44
	6-50	10	18	176
	51-200	0	0	0
	201-500	0	0	0
Aspen	0-5	31	1	45
	6-50	7	8	59
	51-200	1	96	96
	201-500	0	0	0
Lodgepole Pine	0-5	73	1	70
	6-50	29	13	369
	51-200	3	66	198
	201-500	1	255	255
Mixed Coniferous Forest	0-5	33	1	34
	6-50	13	12	152
	51-200	3	1	34
	201-500	0	0	0
Spruce-Fir	0-5	74	1	56
	6-50	13	17	219
	51-200	1	57	57
	201-500	0	0	0
Spruce-Fir Old Growth	0-5	22	1	29
	6-50	10	49	195
	51-200	1	165	165
	201-500	1	308	308

Table 4. Expected frequency of occurrence of various forested blocks on the project area resulting from the implementation of Alternative D- Master Development Plan.

Habitat Type	Block Size	Number of Blocks	Average Acres	Total Acres
Aspen/ Conifer	0-5	58	1	70
	6-50	12	12	149
	51-200	0	0	0
	201-500	0	0	0
Aspen	0-5	37	1	51
	6-50	7	8	55
	51-200	1	95	95
	201-500	0	0	0
Lodgepole Pine	0-5	83	1	99
	6-50	36	13	482
	51-200	4	78	310
	201-500	0	0	0
Mixed Coniferous Forest	0-5	45	1	57
	6-50	22	11	235
	51-200	3	65	196
	201-500	0	0	0
Spruce-Fir	0-5	109	1	90
	6-50	17	14	242
	51-200	0	0	0
	201-500	0	0	0
Spruce-Fir Old Growth	0-5	34	1	39
	6-50	17	21	362
	51-200	3	99	296
	201-500	0	0	0

APPENDIX E

Forest Plan Consistency Analysis

Forest Plan Consistency Analysis

A Forest Plan Consistency Analysis was completed for all alternatives to be determined if they were consistent with the General Direction and Standards & Guidelines outlined in the White River National Forest Land and Resource Management Plan (1984).

Many of the plan's stipulations are not applicable to the activities proposed at Vail Category III and therefore are not included in this Consistency Analysis. General Forest Direction, Management Area Prescription 1B, Management Area Prescription 9A, and associated Standards & Guidelines relevant to this proposal are included in this analysis.

MANAGEMENT DIRECTION

Management Direction is expressed in terms of both Forest Direction and Management Area Direction. Forest Direction consists of goals, objectives, and management requirements which are generally applicable to the entire Forest. Management Area Direction contains management requirements specific to individual areas within the Forest and are applied IN ADDITION to the Forest Direction requirements (Forest Plan, III-1). Management Direction responds to public issues, management concerns, and opportunities within the availability, suitability, and capability of the land and resources.

MANAGEMENT PRESCRIPTION 1B: (Provides for existing winter sports sites.)

MANAGEMENT PRESCRIPTION SUMMARY

Management emphasis provides for downhill skiing on existing sites and maintains selected inventoried sites for future downhill skiing recreation opportunities. Management integrates ski area development and use with other resource management to provide healthy tree stands, vegetative diversity, forage production for wildlife and livestock, and opportunities for non-motorized recreation.

Visual resources are managed so that the character is one of forested areas interspersed with openings of varying widths and shapes. Facilities may dominate, but harmonize and blend with the natural setting. Harvest methods in forested areas between ski runs are clearcutting in aspen, and lodgepole pine, shelterwood in interior ponderosa pine and mixed conifers, and group selection in Engelmann spruce-subalpine fir, or as specified in the permittee's site-specific Master Development Plan.

MANAGEMENT PRESCRIPTION 9A: (Emphasis is on Riparian Area Management.)

Emphasis is on the management of all of the component ecosystems of riparian areas. These components include the aquatic ecosystem, the riparian ecosystem (characterized by distinct vegetation), and adjacent ecosystems that remain within approximately 100 feet measured horizontally from both edges of all perennial streams and from the shores of lakes and other still water bodies. All of the components are managed together as a land unit comprising an integrated riparian area, and not as separate components.

The goals of management are to provide healthy, self-perpetuating plant communities, meet water quality standards, provide habitats for viable populations of wildlife and fish, and provide stable stream channels and still water-body shorelines. The aquatic ecosystem may contain fisheries habitat improvement and channel stabilization facilities that harmonize with the visual setting and maintain or improve wildlife or fish habitat requirements. The linear nature of streamside riparian areas permits programming of management activities which are not visually evident or are visually subordinate.

Forest riparian ecosystems are treated to improve wildlife and fish habitat diversity through specific silvicultural objectives. Both commercial and noncommercial vegetation treatments are used to achieve multi-resource benefits. Clearcutting is used to regenerate aspen clones. Other forest cover types are treated with either small-group or single-tree selection methods.

Livestock grazing is at a level that will assure maintenance of the vigor and regenerative capacity of the riparian plant communities. Vehicular travel is limited on roads and trails at times when the ecosystems would be unacceptably damaged. Developed recreation facility construction for overnight use is prohibited within the 100-year floodplain.

The management area over which this prescription is to be applied will also be affected by several management activities in the Forest-wide direction. Most notable is the direction involving upland zones, in the Water Resource Improvement and Maintenance management activity, and elsewhere.

MANAGEMENT PRESCRIPTION 1B-1: (Provides for existing winter sports sites.)

MANAGEMENT PRESCRIPTION SUMMARY

Management emphasis provides for downhill skiing on existing downhill ski sites. Management integrates ski area development and use with other resource management to provide healthy tree stands, vegetative diversity, forage production for wildlife and livestock, and opportunities for non-motorized recreation.

Visual resources are managed so that the character is one of forested areas interspersed with openings of varying widths and shapes. Facilities may dominate, but harmonize and blend with the natural setting. Harvest methods in forested areas between ski runs are clearcutting in aspen, 3-step shelterwood, single tree selection or group selection in Engelmann spruce-subalpine fir, lodgepole pine, ponderosa pine and mixed conifers, or as specified in an approved site specific vegetation management plan.

Table E1. Review of the Consistency Between The Proposed Action and the White River National Forest Plan

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal																																			
Diversity on National Forests and National Grasslands	1. Maintain structural diversity of vegetation on units of land 5,000 to 20,000 acres in size, or fourth-order watersheds, that are dominated by forested ecosystems. (0061)	<p>a. Maintain or establish a minimum of 20 percent of the forested area within a unit to provide vertical diversity. (6030)</p> <p>b. Maintain or establish a minimum of 30 percent of the forested area within a unit to provide horizontal diversity. (6031)</p> <p>c. In forested areas of a unit, 5 percent or more should be in old-growth and 5 percent or more should be in grass-forb stages. (6032)</p> <p>d. In forested units, create or modify created openings so they have a Patton edge-shape index of at least 1.4 and have at least a medium-edge contrast. (6033)</p> <p>e. Apply the following optimum successional/structural stage distribution for forested and nonforested lands available for vegetation management.</p> <table><tr><td>SP</td><td>EARLY</td><td>INTMD</td><td>LATE</td><td>OG</td></tr><tr><td>LP</td><td>30%</td><td>30%</td><td>30%</td><td>10%</td></tr><tr><td>AA</td><td>27%</td><td>36%</td><td>27%</td><td>10%</td></tr><tr><td>DF</td><td>14%</td><td>45%</td><td>36%</td><td>10%</td></tr><tr><td>SF</td><td>32%</td><td>26%</td><td>32%</td><td>10%</td></tr><tr><td>PJ</td><td>30%</td><td>24%</td><td>36%</td><td>10%</td></tr><tr><td>OK</td><td>40%</td><td>20%</td><td>-</td><td>-</td></tr></table> <p>If present amount of successional/structural stage is less than the stated percentage, management activities should be designed to increase this size class to desired level.</p> <p>LP = Lodgepole Pine AA = Aspen DF = Douglas Fir SF = Spruce Fir OK = Oak/Mountain Shrub FJ = Pinon/Juniper</p>	SP	EARLY	INTMD	LATE	OG	LP	30%	30%	30%	10%	AA	27%	36%	27%	10%	DF	14%	45%	36%	10%	SF	32%	26%	32%	10%	PJ	30%	24%	36%	10%	OK	40%	20%	-	-	<p>a. through c. are met. See Biodiversity Analysis.</p> <p>Unknown. Analysis incomplete to date.</p>
SP	EARLY	INTMD	LATE	OG																																		
LP	30%	30%	30%	10%																																		
AA	27%	36%	27%	10%																																		
DF	14%	45%	36%	10%																																		
SF	32%	26%	32%	10%																																		
PJ	30%	24%	36%	10%																																		
OK	40%	20%	-	-																																		
	2. Retain existing medium or high-contrast edges within forested diversity units. (0060)																																					

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	<p>3. If medium contrast edges are created in units dominated by grassland or shrubland, create openings with Patton edge-shape index of at least 1.4. Manage unmanipulated plant communities to reach late seral stages. (0288)</p> <p>4. In forested diversity units, maintain at a minimum on each treated area, an average of 20 to 30 snags (in all stages of development) per 10 acres well distributed over the diversity unit. (0905)</p>	<p>a. Maximum size of individual treated areas is 500 acres. (6237)</p> <p>a. Provide at a minimum, an average 6 to 10 snags per 10 acres of the following minimum diameters (where biologically feasible):</p> <ul style="list-style-type: none"> - Ponderosa Pine, Douglas-fir, and spruce-fir: 10 inches dbh. - Aspen and Lodgepole pine: 8 inches dbh. (6021) <p>b. Retain an average length per acre of down-dead logs (where biologically feasible) of the following minimum diameters:</p> <ul style="list-style-type: none"> - Ponderosa Pine, Douglas-fir, and spruce-fir: 12 inch diameter, 50 linear feet/acre. - Aspen and Lodgepole pine: 10 inch diameter, 33 linear feet/acre. (6022) 	Not in compliance in Vail Category I.
	<p>5. Manage aspen for retention wherever it occurs, unless justified by one of the following:</p> <ul style="list-style-type: none"> a. Conversion of determinate aspen to conifers, or shrub - or grass/forb seral stages for wildlife, aesthetic, recreation, transportation, or watershed purposes. b. Conversion of determinate aspen to conifers on sites with high site index for conifers, in conjunction with a high demand for softwood; or c. Areas of aspen which are larger than are needed for wildlife or aesthetic purposes. (0286) 		
	<p>6. If determinate aspen stands are managed for regeneration, treat contiguous areas no larger than 40 acres, unless larger areas are needed to protect aspen regeneration or prevent decadence. Treat entire clones. Indeterminate (climax) aspen stands can be converted to other cover types if needed to meet other objectives. (0287)</p>		

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
Cultural Resource Management	<p>1. Protect, find an adaptive use for, or interpret all cultural resources on National Forest System (NFS) lands which are listed on the National Register of Historic Places, the National Register of Historic Landmarks, or have been determined to be eligible for the National Registers. (0039)</p> <p>2. Nominate or recommend cultural resource sites to the National Register of Historic Places by 1990 in the following priority:</p> <ul style="list-style-type: none"> a. Sites representing multiple themes; b. Sites representing themes which are not currently on the National Register within the State; or c. Sites representing themes which are currently represented by single sites. (0045) <p>3. Protect and foster public use and enjoyment of cultural resources:</p> <ul style="list-style-type: none"> a. Complete cultural resource surveys prior to any ground-disturbing project; b. Avoid disturbance of known cultural resources until evaluated and determined not significant; c. Collect and record information from sites where there is no other way to protect the properties; d. Issue antiquities permits to qualifying academic institutions or other organizations for the study and research of sites. (0131) 	<p>a. Following direction in FSM 2360 (6310)</p>	<p>Done.</p>
			No sites have been found eligible.
			Cultural Resource Survey completed. Sites evaluated.
Visual Resource Management (A04)	<p>1. Apply the Visual Management System to all National Forest System (NFS) lands. Travel routes, use areas and water bodies determined to be of primary importance are sensitivity level 1 and appropriate Visual Quality Objectives are established according to the Visual Management System. (0360)</p>	<p>a. Follow direction provided in FSM 2380 and FSH 2309.16 through FSH 2309.25. (6205)</p>	<p>See Visual Standards & Guidelines for Management Area 1B.</p>

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	<p>2. Rehabilitate all existing projects and areas which do not meet the adopted Visual Quality Objective(s) (VQO) specified for each management area. Set priorities for rehabilitation, considering the following:</p> <ul style="list-style-type: none"> a. Relative importance of the area and the amount of deviation from the adopted VQO. Foreground areas have highest priority; b. Length of time it will take natural processes to reduce the visual impacts so that they meet the adopted VQO; c. Length of time it will take rehabilitation measures to meet the adopted VQO; and d. Benefits to other resource management objectives to accomplish rehabilitation. (0363) 		
	<p>3. Achieve enhancement of landscapes through addition, subtraction or alteration of elements of the landscape such as vegetation, rock-form, water features or structures. Examples of these include:</p> <ul style="list-style-type: none"> a. Addition of vegetation species to introduce unique form, color or texture to existing vegetation. b. Vegetation manipulation to open up vistas or screen out undesirable views. (0364) 		
	<p>4. Plan, design and locate vegetation manipulation in a scale which retains the color and texture of the characteristic landscape, borrowing directional emphasis of form and line from natural features. (0365)</p>	<ul style="list-style-type: none"> a. Meet the Visual Quality Objectives of retention and partial retention one full growing season after completion of a project. Meet modification and maximum modification objectives three full growing seasons after completion of a project. (6259) b. Determine sensitivity levels in accordance with FSH 2309.16, Agriculture Handbook No. 462, Vol. 2, Chapter 1; Sensitivity Levels. (6272) 	<p>Meet through incorporation of mitigation measures in Master Planning phase.</p> <p>Meet through incorporation of mitigation measures in Master Planning phase.</p>
	<p>5. Emphasize visually appealing landscapes (vista openings, rock outcroppings, diversity of vegetation, etc.). (0104)(1B Management Area)</p>	<ul style="list-style-type: none"> a. Do not exceed an Adopted Visual Quality Objective (VQO) of modification. (6204) b. Apply rehabilitation practices where the above objectives are not currently being met. (6068) 	<p>Met by all alternatives.</p> <p>Met by all alternatives through ongoing Summer Operations Program.</p>

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
Recreation Site Construction and Rehabilitation (A05 and 06)	6. Design and implement management activities which sustain inherent visual values of riparian areas and blend with the surrounding natural landscape. (0656)(9A Management Area).	a. Do not exceed an Adopted Visual Quality Objective (VQO) or Partial Retention. (6135)	Met through incorporation of mitigation measures in Master Planning phase.
	7. Blend soil disturbance into natural topography to achieve a natural appearance, reduce erosion and rehabilitate ground cover. (0366)		Incorporate in Master Plan.
	8. Revegetate disturbed soils. In large projects, this may have to be done in stages. (0456)	a. Revegetate disturbed soils by the following growing season. (6276)	Incorporate in Master Plan.
	9. Choose facility and structure design, color of materials, location and orientation to meet the adopted visual quality objective(s) for the management area. (0367)		Incorporate in Master Plan.
	1. Design and locate improvements on winter sport sites to provide safety to users and to harmonize with the natural environment. (0358)(1B Management Area)	a. Follow construction/reconstruction standards specified in the approved Master Development Plan (6282)	Met by all alternatives
	2. Design and locate improvements on winter sport sites to provide safety to users and to harmonize with the natural environment. (0358)(9A Management Area)	b. Develop construction and reconstruction standards in the Master Development Plan and summer work/operation plan. (6828WR)	Met by all alternatives.
	3. Minimize disturbance to the riparian area by winter sports site activities. Initiate timely and effective rehabilitation of disturbed areas so that a vegetation ground cover or suitable substitute protects the soil from erosion and prevents increased sediment yield. (0911)(9A Management Area)	a. Develop construction and reconstruction standards in the Master Development Plan and summer work/operation plan. (6828)	Met by all alternatives.
	4. Provide appropriate development facilities where the private sector is not meeting the demand. (0441)		Incorporate into Master Development Plan.
	5. Maintain cost-effective developed recreation facilities which complement non-Forest Service developments. (0442)		
	6. Provide facilities which are accessible to handicapped persons. (0443)		

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
Management of Developed Recreation Sites (A08, 09, 11 & 13)	1. Design, construct and operate developed sites which are adjacent to or provide an access point into a wilderness to complement wilderness management objectives. (0350)		
	2. Dispersed activities that are compatible with ski area operation and management will be encouraged. Year-round recreation will be encouraged when consistent with other resource objectives. (0605)(1B Management Area)		
	3. Schedule vegetative and water yield treatments within fourth-order watersheds to maintain water quality and stream channel stability. (0606WR)(1B Management Area)	a. Ski area must have physical and legal water supplies available. (6401WR)	Met by all alternatives.
	4. To maintain and protect aquatic and riparian habitat, prohibit all camping and other human activities within the riparian corridor except for defined access points.		
Dispersed Recreation Management (A14 & 15)	1. Provide a broad spectrum of dispersed recreation opportunities in accordance with the established Recreation Opportunities Spectrum (ROS) classification for the management area. (0351)		
	2. Close or rehabilitate dispersed sites where unacceptable environmental damage is occurring. (0040)	a. Close sites that cannot be maintained in Frissell Condition Class 1, 2, or 3 (Campsite Condition, Frissell, S.S., Journal of Forestry, August 1978). (6023) b. Rehabilitate sites that are in Frissell Condition Class 4. (6197)	Unknown for the project area and landscape assessment area. Unknown for the project area and landscape assessment area.
	3. Semi-primitive non-motorized, semi-primitive motorized, roaded natural and rural recreation opportunities can be provided. (0445)(9A Management Area)		

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal												
	<p>4. Provide roaded natural recreation opportunities within ½ mile of Forest arterial, collector and local roads with better than primitive surfaces open to public travel. Provide semi-primitive motorized recreation opportunities with a low to moderate incidence of contact with other groups and individuals within ½ mile of designated local roads with primitive surfaces and trails open to motorized recreation use.</p> <p>Where local roads are closed to public motorized recreation travel, provide for dispersed non-motorized recreation opportunities. Manage recreation use to provide for the incidence of contact with other groups and individuals appropriate for the established ROS class.</p> <p>Provide semi-primitive non-motorized recreation opportunities in all areas more than ½ mile away from roads and trails open to motorized recreation use. (0650)(9A Management Area)</p>	<p>a. Maximum use and capacity levels are:</p> <ul style="list-style-type: none"> - trail and camp encounters during peak use days are less than 6 other parties per day. - trail and area-wide use capacity: <hr/> <p>ROS Class-Primitive</p> <table> <tr> <th>Use Level</th><th>Very Low</th><th>Moderate</th><th>High</th></tr> <tr> <td>On trails PAOT/mile</td><td>0.5</td><td>1.0</td><td>2.0 3.0</td></tr> <tr> <td>Area-wide PAOT/acre</td><td>.001</td><td>.002</td><td>.007 .025</td></tr> </table> <p>Reduce the above use level co-efficients as necessary to reflect usable acres, patterns of use, and general attractiveness of the specific management area type as described in the ROS Users Guide, Chapter 25.</p> <p>Reduce the above use levels where unacceptable changes to the biophysical resources will occur. (6402)(9A Management Area)</p>	Use Level	Very Low	Moderate	High	On trails PAOT/mile	0.5	1.0	2.0 3.0	Area-wide PAOT/acre	.001	.002	.007 .025	Unknown for the project area and landscape assessment area.
Use Level	Very Low	Moderate	High												
On trails PAOT/mile	0.5	1.0	2.0 3.0												
Area-wide PAOT/acre	.001	.002	.007 .025												
	5. Permit undesignated sites in Frissell Condition Class 1 through 3 where unrestricted camping is permitted. (0174)(9A Management Area)														
	6. Manage sites use and occupancy to maintain sites within Frissell Condition Class 3 except for designated sites which may be Class 4. Close and restore Class 3 sites. (0175)(9A Management Area)														
	7. Prohibit motorized vehicle use (including snowmobiles) off Forest system roads and trails in alpine shrub and Krusholz ecosystems. Prohibit motorized use (except snowmobiles operating on snow) in other ecosystems where needed to protect soils, vegetation, or special wildlife habitat. (0154)(9A Management Area)														
	8. Harden, or close to recreation use any access points which input sediment into streams, rivers, and lakes. Access points include, but are not limited to, day-use and fisherman parking, boat access and ramps, and trailheads adjacent to riparian areas. (9A Management Area)														

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	9. Discourage dispersed camping that will encroach on aquatic and riparian systems. (9A Management Area)		
	10. Prohibit camping within a minimum of 100 feet from lakes and streams unless exceptions are justified by terrain or specific design which protects the riparian and aquatic ecosystems. (0353)		
	11. Manage resource activities and facilities in accordance with the Regional Acceptable Work Standards. (0391)	a. FSM 1310 R2 ID No. 1 7/22/82. (6194)	
* Rec Mgmt			
Wildlife and Fish Resource Management	1. Where present the following species are Management Indicator Species: - Deer; - Elk; and - All Federally and State listed endangered or threatened plant and animal species.		
	2. In addition to the above, use indicator species that represent the following categories: a. Riparian area dependent species; b. Wetland dependent species; c. Species dependent on either climax plant communities or one seral stage of a plant community or communities (forested land and rangeland); d. Tree cavity-dependent species; e. Game fish; f. Unique habitats for which there are dependent species (cliff, talus, cave); g. Small game species; h. Species dependent on multi-storied tree stands by commercial forest cover type; and i. Species which have particular scientific, local, or national interest, and species needing special management to prevent Federal or State listing as threatened and endangered. (0459)		
	3. Maintain habitat for viable populations of all existing vertebrate wildlife species. (0289)	a. Habitat for each species on the forest will be maintained at least at 40 percent or more of potential. (6289)	See Wildlife and Biodiversity sections of the Environmental Consequences.

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	4. Establish elk, moose, bighorn sheep, and Federal and State threatened and endangered species on sites that can supply the habitat needs of the species and the population levels and distribution agreed to with the states. (0461)		
	5. Manage waters capable of supporting self-sustaining trout populations to provide for those populations. (0290)		
	6. Manage and provide habitat for recovery of endangered and threatened species as specified in the Regional Forester's 1920 (2670) letter dated June 25, 1982. (0740)		See the Biological Assessment and Biological Evaluation for this project.
	7. Consider essential big game winter range for acquisition during review of land trade proposals. (0901)		
	8. When application is made to construct a developed recreation site, the forest will, in its project assessment, clearly identify off-site impacts, including impacts on non Forest system lands, on big game winter range, wetlands, or other important wildlife habitat types, as well as prescribe measures to mitigate on-site impacts of such projects. (0912)		
	9. Permit fish and wildlife research and management using guidelines developed by the International Association of Fish and Wildlife Agencies (FSM2323.3). (0179)		

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	<p>10. Inventory aquatic habitat associated with perennial streams and lakes on the forest. Maintain this aquatic habitat in at least its current condition with stable or improving trends. Improve aquatic systems to an overall upward trend.</p>	<p>a. Initiate inventories on perennial streams and lakes to determine existing physical, biological and chemical conditions and where justified, recommend actions to restore, maintain, or enhance these conditions through changes in management strategies.</p> <p>b. Collect baseline information on perennial streams and lakes to build a data base for aquatic and riparian habitat. Use methods which have been validated through field testing, and accepted by the scientific community.</p> <p>c. Update data bases to insure that inventories reflect existing conditions.</p> <p>d. Initiate macroinvertebrate sampling forest-wide to be used as indicator species for monitoring habitat quality. Set up stations on 5-10 streams/district per year based on funding constraints.</p>	
	<p>11. Manage aquatic habitat to provide for the stability and diversity of invertebrate and vertebrate populations on all perennial streams and lakes. Management emphasis will be on waters capable of supporting self-sustaining trout populations.</p>	<p>a. Management efforts will be directed toward obtaining optimum pool/riffle/run ratios, pool structure, bank stability stream bottom composition, instream cover, overhanging cover, invertebrate production, water quality, and spawning and rearing habitat. Optimum values are based on individual streams and lakes and the fish species present.</p> <p>b. Analyze aquatic habitat quality and potential based on results of macroinvertebrate sampling as it relates to their tolerance levels to environmental stress or perturbations.</p> <p>c. Maintain fish habitats at a level which reflects at least 60 percent of their potential.</p> <p>d. Manage stream and lake habitat to at least 70 percent of its potential where existing self-sustaining fisheries occur. Mitigation measures will be included in project programs for management activities which cause unfavorable conditions.</p>	

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	12. Prioritize streams and lakes for management on their current condition and ability to support self-sustaining trout populations and manage these streams to provide optimal habitat for trout populations.	<p>a. Conduct biomass/population estimates and age structure composition in cooperation with Colorado Division of Wildlife (CDOW) to determine the carrying capacity of streams where populations are not supplemented by CDOW stocking programs.</p> <p>b. If alternatives to management which cause unfavorable conditions cannot be developed, then mitigation measures will be included in project proposals.</p>	
Wildlife Habitat Improvement and Maintenance	1. Use both commercial and noncommercial silvicultural practices to accomplish wildlife habitat objectives.	<p>a. In forested areas, maintain deer or elk hiding cover on 60 percent or more of the perimeter of all natural openings, all created openings and along at least 75 percent of the edge of arterial and collector roads and 40 percent along streams and rivers. Not more than one half of the hiding cover can be contiguous to another portion of the hiding cover. Along streams and rivers in addition to hiding cover, 20 percent or more of the edge must be in thermal cover. (6188)</p> <p>b. In diversity units dominated by forested ecosystems, maintain a minimum of 40 percent of the diversity unit in deer or elk hiding cover. This hiding cover should be well distributed over the unit. Maintain 20 percent of the diversity unit in thermal cover (winter or spring-summer). Hiding cover can be used to meet thermal cover requirements also, if the indeed coincide biologically. (6312)</p>	<p>Incorporate in Master Planning Process; the Project Area is in compliance, Vail Category I may not be in compliance.</p> <p>Project Area meets criteria; Vail Category I does not meet criteria where roads are concentrated.</p>
	2. Improve habitat capability through direct treatments of vegetation, soil, and waters. (0337)		
	3. Conduct habitat improvement projects jointly or cooperatively funded with the States. (0339)		
	4. Maintain edge contrast of at least medium or high between tree stands created by even-aged management. (0449)	a. Contrast by Age Class - See actual Forest Plan Standards & Guidelines.	
	5. Prioritize and plan lake and stream habitat improvement projects with the assistance of state wildlife agencies where aquatic habitats have been demonstrated to be below productive potential.	a. See actual Forest Plan Standards & Guidelines.	

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	6. Improve fish habitats through structural and nonstructural improvements.	a. See FSH 2609.11, Chapter 10 and 20.	
	7. Maintain cooperative fish stocking programs in lakes and streams where natural fish production is inadequate to meet the harvest demands imposed by fishing pressure.		
	8. Cooperate with the state agencies to meet minimum flow requirements to support resident fish populations.	<p>a. Review data base to determine on which waters instream flows;</p> <ol style="list-style-type: none"> 1. May be insufficient to meet life history requirements or desired vertebrate and invertebrate species; 2. Need to be maintained to provide for existing vertebrate and invertebrate species; 3. Are of highest priority due to adjacent land use activities. <p>b. Determine quantity, depth, and surface acres of water necessary to maintain a minimum conservation pool in new reservoir construction and reconstruction projects to hold over resident fish populations.</p>	
Wildlife and Fish Cooperation with Other Agencies	1. Manage animal damage in cooperation with the State Wildlife Agencies, Fish and Wildlife Service, other appropriate agencies, and cooperators to prevent or reduce damage to other resources and direct control toward preventing damage or removing only the offending animal. (0097)		
Range Resource Management	1. Manage livestock grazing to enhance recreation opportunities in existing and proposed recreation sites. (0110)(1B Management Area)	a. Maintain vegetation in fair or better range condition. (6061)	Addressed in Allotment Management Plan.
Silvicultural Prescriptions (E03, 06 & 07)	<p>1. Manage forest cover types on the permitted area to enhance visual quality, diversity, and recreation opportunities, and to provide for a healthy forest cover in existing and proposed winter sports sites. (0450)(1B Management Area)</p> <p>Manage forest cover types to perpetuate tree cover and provide healthy stands, high water quality, and wildlife and fish habitat. (9A Management Area)</p>		

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	<p>2. Manage tree stands between ski runs using the following harvest methods, or methods specified in an approved site-specific vegetation plan:</p> <ul style="list-style-type: none"> - Clearcut in aspen and lodgepole pine; - Shelterwood in interior ponderosa pine and mixed conifer, - Group Selection in Englemann spruce-subalpine fir. (0169)(1B Management Area) <p>Manage forest cover types using the following harvest methods:</p> <ul style="list-style-type: none"> - Clearcut in aspen, and - Selection (Group or Single tree) in all other cover types. (0186)(9A Management Area) 	<p>a. Apply harvest treatments to forest cover types as specified (see actual Forest Plan Standards & Guidelines) unless approved site-specific vegetation management plans exist for the area. Apply treatments specified in site-specific plans on those areas where approved plans exist. (6074)</p> <p>b. Silvicultural Standards: (These standards may be exceeded on areas managed for old growth). (See actual Forest Plan Standards & Guidelines.)</p> <p>9A(a.) Apply harvest treatments to forest cover types as specified in actual Forest Plan Guidelines on at least 80 percent of the Forest Plan. Up to 20 percent of the type may be treated using other harvest methods specified in the Forest Direction.</p>	<p>Will be met as design feature of the Master Development Plan.</p> <p>Will be met as design feature of the Master Development Plan.</p> <p>Will be met as design feature of the Master Development Plan.</p>
	3. Limit timber harvest activities to periods of low recreation use activity or to coincide with ski area construction activity. (0468)(1B Management Area)		
	4. Utilize firewood material using both commercial and noncommercial methods. (0147)(1B Management Area)		
	5. The combined water yield effects of type conversion on ski runs and increased on-site water from stand regeneration must be determined. Do not exceed threshold limits of water quality and drainage system stability deterioration. (0610)(1B Management Area)		

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	<p>6. For management purposes of forested areas between ski trails or other permanent openings, a cut-over area is considered an opening until such time as:</p> <ul style="list-style-type: none"> - Increased water yield drops below 50 percent of the potential increase; - Forage and/or browse production drops below 40 percent of potential production; - Deer and elk hiding cover reaches 60 percent of potential; - Minimum stocking standards by forest cover type and site productivity are met; and - The area appears as a young forest rather than a restocked opening, and takes on the appearance of the adjoining characteristic landscape. (0501)(1B Management Area) 	<p>a. When the visual Quality Objective of an area is modification or maximum modification, the regenerated stand shall meet or exceed all of the following characteristics before a cut-over area is no longer considered an opening. (See actual Forest Plan Standard & Guidelines.)</p>	Unknown compliance in the existing developed area.
	<p>7. The maximum size of openings created by the application of even-aged silviculture will be 40 acres regardless of forest cover type. Exceptions are:</p> <ul style="list-style-type: none"> a. Proposals for larger openings are subject to a 60-day public review and are approved by the Regional Forester; b. Larger openings are the result of natural catastrophic conditions of fire, insect or disease attack, windstorm; or c. The area does not meet the definition of created openings. (0017) 	<p>a. Size of openings: Patch clearcuts: 1-10 acres Clearcuts: 10-40 acres (6073)</p>	
	8. Acceptable management intensity activities to determine harvest levels by referring to the actual Forest Plan General Direction.		
	9. Establish a satisfactory stand either naturally or through artificial regeneration methods within a 5 year period after disturbance. (0726)(9A Management Area)		
	10. Prohibit log landing and decking areas within the riparian area. (0670)(9A Management Area)		
	11. Reduce debris jam potential by cutting stumps to near ground level in the 100-year floodplain. (0672)(9A Management Area)		
	9A Forest Direction and Standards & Guidelines are incorporated into other resources via Management Area.		
Riparian Area Management			

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	1. Design and implement activities in management areas to protect and manage the riparian ecosystem.	a. Maintain all riparian ecosystems in at least an upper mid-seral successional stage based upon the R2 Riparian Ecosystem Rating System.	Incorporate into Master Plan.
	2. Manage riparian areas to reach the latest seral stage possible within the stated objectives.		
	3. Prescribe silvicultural and livestock grazing systems to achieve riparian area objectives.		
	4. Locate and construct arterial and collector roads to maintain the basic natural condition and character of riparian areas.		
	5. Prevent or remove debris accumulations that reduce stream channel stability and capacity. (0001)		
	6. Prevent soil surface compaction and disturbance in riparian ecosystems. Allow use of heavy construction equipment for construction, residue removal, etc., during periods when the soil is least susceptible to compaction or rutting. (0003)		
Water Uses Management	1. Proposed new land-use facilities (roads, campgrounds, buildings) will not normally be located within floodplain boundaries for the 100-year flood. Protect present and all necessary future facilities that cannot be located out of the 100-year floodplain by structural mitigation (deflection structures, riprap, etc.). (0488)		
	2. Prevent stream channel instability, loss of channel cross-sectional areas, and loss of water quality resulting from activities that alter vegetative cover. (0007)		
	3. Determine and obtain rights to instream flow volumes to fulfill all National Forest uses and purposes. (0009)		
	4. Protect water right applications of others when such uses will lower streamflows below levels acceptable for National Forest uses and purposes.		

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
Water Resource Improvement and Maintenance	5. Special Use Permits, easements, rights-of-way, and similar authorizations for use of NFS lands shall contain conditions and stipulations to maintain instream or by-pass flows necessary to fulfill all National Forest uses and purposes. (0604)		
	6. Make instream flow requirements a part of all new water diversion projects to fulfill current and future National Forest needs. (0612)		
	7. Maintain acquired water rights that meet National Forest needs: Sell or trade all other acquired water rights. (0613)		
	1. Maintain instream flows and protect public property and resources.		
	2. Improve or maintain water quality to meet State water quality standards. However, where the natural background water pollutants cause degradation, it is not necessary to implement improvement actions. Short-term or temporary failure to meet some parameters of the State standard, such as increased sediment from road crossing construction or water resource development may be permitted in special cases.		All Alternatives designed to meet 401 permit requirements.
	3. Schedule vegetative and water yield treatments within fourth-order watersheds to maintain water quality and stream channel stability. (0606)	a. Provide mitigation measures necessary to prevent increased sediment yields from exceeding "threshold limits" (as determined by "State of the Art" modeling ^HYSEDI or actual measurements) identified for each (fourth-order) watershed. (6320)	Assure in Master Planning phase that mitigation measures are in place to keep from exceeding threshold limits.
	4. Rehabilitate disturbed areas that are contributing sediment directly to perennial streams as a result of management activities to maintain water quality and re-establish vegetation cover. (0676)	a. Reduce to natural rate any erosion due to management activity in the season of disturbance and sediment yields within one year of the activity through necessary mitigation measures such as water-barring and revegetation. (6606)	
	5. Limit use of herbicides, insecticides, rodenticides, or other chemical agents as part of management activities to times and places where possible transport to or by surface water has a low probability of occurrence. Follow all label requirements concerning water quality protection. (0678)		

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	<p>6. Maintain sediment yield within threshold limits. The effects on water and sediment yields from vegetation manipulation and road construction projects will be determined through the use of appropriate modeling and/or quantification procedures to determine sediment yield threshold limits and water yield increase potentials. (0632)(9A Management Area)</p>	<p>a. Limit changes in channel rating or classification scores to an increase of 10 percent or less. Use channel stability criteria established by Cooper, 1978 and Pfankuch, 1975. Use channel classification criteria established by Rosgen, 1980. (6001)</p> <p>b. Prescription-induced water yield increases should not exceed prescribed thresholds of allowable increase nor should the total yield of water and sediment exceed maximum allowable amounts as stated in the above reference. (6060)</p> <p>c. Maintain at least 80 percent of potential ground cover within 100 feet from the edges of all perennial streams, lakes and other water bodies, or to the outer margin of the riparian ecosystem, where wider than 100 feet. (6650)</p>	
	<p>7. Avoid channelization of natural streams. Where channelization is necessary for flood control or other purposes, use stream geometry relationship to reestablish meanders, width/depth ratios, etc. consistent with each major stream type. (0680)(9A Management Area)</p>		
	<p>8. Treat disturbed areas resulting from management activities, to reduce sediment yields to the natural erosion rates in the shortest possible time. (0684)(9A Management Area)</p>		
	<p>9. Stabilize streambanks which are damaged beyond natural recovery in a reasonable time period with appropriate methods or procedures that emphasize control by vegetation. (0686)(9A Management Area)</p>		
	<p>10. Design and locate settling ponds to reduce downstream sediment yield and to prevent washout during high water. Locate settling ponds outside of the active channel. Restore any channel changes to hydraulic geometry standards for each stream type. (0688)(9A Management Area)</p>		
	<p>11. Include wildlife and fish habitat, aesthetic, or safety goals when planning projects that result in vegetation type conversion. (0690)(9A Management Area)</p>		

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	<p>12. Require concurrent monitoring to ensure that mitigative measures are effective and in compliance with state water quality standards. (0692)(9A Management Area)</p>		
Soil Resource Management	<p>1. Maintain soil productivity, minimize man-caused soil erosion, and maintain the integrity of associated ecosystems.</p> <ol style="list-style-type: none"> Use site preparation methods which are designed to keep fertile, friable topsoil essentially intact. Give roads and trails special design considerations to prevent resource damage on capability areas containing soils with high shrink-swell capacity. Provide adequate road and trail cross drainage to reduce sediment transport energy. Revegetate all areas, capable of supporting vegetation, disturbed during road construction and/or reconstruction to stabilize the area and reduce soil erosion. Use less palatable plant species on cuts, fills, and other areas subject to trampling damage by domestic livestock and big game to discourage grazing by herbivores. Prevent livestock and wildlife grazing which reduces the percent of plant cover to less than the amount needed for watershed protection and plant health. Place tractor-built firelines on the contour, where possible, and avoid use of tractors on highly erodible sites. Provide permanent drainage and establish protective vegetative cover on all new temporary roads or equipment ways, and all existing roads which are being removed from the transportation system. Minimize soil compaction by reducing vehicle passes, skidding on snow, frozen or dry soil conditions, or by off-ground logging systems. Restore soil disturbance caused by human use to soil loss tolerance levels commensurate with the natural ecological processes for the treatment areas. (0608) 	<p>a. Use the following Standards & Guidelines unless more site specific requirements are developed during project design.</p> <ol style="list-style-type: none"> Limit intensive ground disturbing activities on unstable slopes and highly erodible sites. Apply Packer's guides in the design for cross-drain spacing and buffers. Chisel or rip, on the contour, compacted soils. Soils are considered compacted if there is a 15 percent increase in bulk density or a 50 percent decrease in macro pore space. (6322) 	Implement in Master Planning process.

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	<p>2. Minimize resource damage, investment costs, and risk to life and property from geologic hazards and soil erosion.</p> <p>a. Consider geologic and soil suitability when performing soil disturbing activities.</p> <p>b. For high investment projects, conduct a slope stability analysis on areas identified as potentially unstable. (0600)</p>		
	<p>3. Prevent soil surface compaction and disturbance in riparian ecosystems. Allow use of heavy construction equipment for construction, residue removal, etc., during periods when the soil is least susceptible to compaction or rutting. (0003)(9A Management Area)</p>		
	<p>4. Maintain or enhance the long-term productivity of soils within the riparian ecosystem. (0694)(9A Management Area)</p>		
	<p>1. Classify areas as to whether off-road vehicle use is permitted. (0452)</p>	<p>a. Specify off-road vehicle restrictions based on ORV use management (FSM 2355, R2 Supp. 88). (6083)</p>	
Transportation System Management	<p>2. Close all newly constructed roads to public motorized use unless documented analysis shows:</p> <p>a. Use does not adversely impact other resources;</p> <p>b. Use is compatible with the ROS Class established for the area;</p> <p>c. They are located in areas open to motorized use;</p> <p>d. They provide user safety;</p> <p>e. They serve an identified public need;</p> <p>f. The area accessed can be adequately managed; and</p> <p>g. Financing is available for maintenance or cooperative maintenance can be arranged. (0075)</p>		

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	<p>3. Manage road use by seasonal closure if:</p> <ul style="list-style-type: none"> a. Use causes unacceptable damage to soil and water resources due to weather or seasonal conditions; b. Use conflicts with the ROS Class established for the area; c. Use causes unacceptable wildlife conflict or habitat degradation; d. Use results in unsafe conditions due to weather conditions; e. They serve a seasonal public or administration need; or f. Area accessed has seasonal need for protection or nonuse. (0076) 		
	<p>4. Keep existing roads open to public motorized use unless:</p> <ul style="list-style-type: none"> a. Financing is not available to maintain the facility or manage the associated use of adjacent lands; b. Use causes unacceptable to soil and water resources; c. Use conflicts with the ROS Class established for the area; d. They are located in areas closed to motorized use and are not "designated routes" in the Forest travel management direction; e. Use results in unsafe conditions unrelated to weather conditions; f. There is little or no public need for them; or g. Use conflicts with wildlife management objectives. (0077) 		
	<p>5. Closed or restricted roads may be used for and to accomplish administrative purposes when:</p> <ul style="list-style-type: none"> a. Prescribed in management area direction statements; b. Authorized by the Forest Supervisor; or c. In case of emergency. (0078) 		

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
	<p>6. Locate roads and trails outside riparian areas unless alternative routes have been reviewed and rejected as being more environmentally damaging. (0718)(9A Management Area)</p> <p>7. Create artificial sediment traps with barriers where the natural vegetation is inadequate to protect the waterway or lake from significant accelerated sedimentation (0720)(9A Management Area)</p> <p>8. Minimize detrimental disturbance to the riparian area by construction activities. Initiate timely and effective rehabilitation of disturbed areas and restore riparian areas so that a vegetation ground cover or suitable substitute protects the soil from erosion and prevents increased sediment yield. (0724)(9A Management Area)</p>	<p>a. Do not parallel streams when road location must occur in riparian areas except where absolutely necessary. Cross streams at right angles. Locate crossings at points of low bank slope and firm surfaces. (6628)</p>	
Local Road Construction and Reconstruction	<p>1. Design and locate local roads in the permitted area:</p> <p>a. To facilitate management of tree stands and wildlife as well as recreation; and</p> <p>b. With the minimum of mileage and earthwork.(0467)(1B Management Area)</p>		Meet in Master Planning process.
Road Maintenance	<p>1. Maintain all roads to the following minimum requirements:</p> <p>a. All arterial and open collectors - Level 3;</p> <p>b. All open local roads - Level 2; and</p> <p>c. All closed roads - Level 1.(0079)</p>	<p>a. See levels of maintenance in FSM 7730. (6274)</p> <p>b. Level 1 maintenance includes upkeep of drainage structures and vegetation cover necessary to prevent erosion. (6324)</p>	Meet in Master Planning process.
Fire Planning and Suppression	<p>1. Provide a level of protection from wildfire that will protect investments and meet recreation management objectives. (0902) (1B Management Area)</p>	<p>a. Wildfire protection levels: Promptly control wildlife burning at all intensity levels. (6805)</p>	Met in Master Planning process

Management Activities	General Direction	Standards & Guidelines	Vail CAT III Proposal
Escaped Fire Suppression	<ol style="list-style-type: none"> Take suppression action on all escaped fires considering the following: <ol style="list-style-type: none"> The values of the resources threatened by the fire (both positive and negative), Management objectives for the threatened area(s), The fuelbeds the fire may burn in, The current and projected weather conditions that will influence fire behavior, Natural barriers and fuel breaks, Social, economic, political, cultural, and environmental concerns, Public safety, Firefighter safety, and Costs of alternative suppression strategies. Use the escaped fire situation analysis to make this determination (FSM 5130.31). (0112) 		
Fuel Treatment	<ol style="list-style-type: none"> Maintain fuel conditions which permit fire suppression forces to meet fire protection objectives for the area. (0113)(1B Management Area) 	<ol style="list-style-type: none"> Reduce or otherwise treat all fuels so the potential fire line intensity of an area will not exceed 100 BTU's/sec/ft (B.I.36) on 90 percent of the days during the regular fire season or break up continuous fuel concentrations exceeding the above standard into blocks no larger than 10 acres. (6806) 	Meet in Master Planning process.
Vegetation Treated by Burning	<ol style="list-style-type: none"> Use prescribed fire to accomplish resource management objectives, such as reducing fuel load building, wildlife habitat improvement, etc. (0101) Limit use of prescribed fires on areas adjacent to riparian areas to protect riparian and aquatic values. (0102) Use unplanned ignition on areas identified in this Plan to achieve management objectives. (0911) 		
Air Resource Management	<ol style="list-style-type: none"> Comply with State and Federal air quality standards (see FSM 2120) 		State permit required.
Insect and Disease Management/Suppression	<ol style="list-style-type: none"> Prevent or suppress epidemic insect and disease populations that threaten forest tree stands with an integrated pest management (IPM) approach consistent with resource management objectives. (0148) 		Meet in Master Planning process (Vegetation Management Plan).

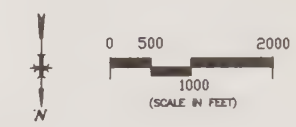
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Vail Ski Area Category III Development Environmental Impact Statement

No Action
Alternative

October 1995



Note:
Due to scale of map, ski facility locations are
representative and not in their exact locations.

KEY:
-Two Elk Creek
& other drainages

MAP
1

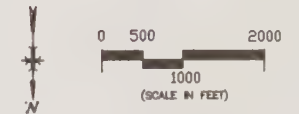


Final Mapping and Geographical Analysis
Pioneer Environmental Services Inc.
Logan, Utah 1995
Source of Digital Base Map: Vail Associates, Inc. 1993

Vail Ski Area Category III Development Environmental Impact Statement

Center Ridge Alternative

October 1995



Note:
Due to scale of map, ski facility locations are
representative and not in their exact locations.

MAP
2

- KEY:**
- Proposed Ski Lift
 - Proposed Ski Trail
 - Proposed Skiway/Road
 - Proposed Bridge Site
 - Two Elk Creek
& other drainages



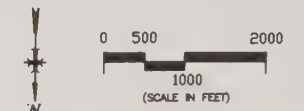
Final Mapping and Geographical Analysis:
Pioneer Environmental Services Inc.
Logan, Utah 1995

Source of Digital Base Map: Vail Associates, Inc. 1993

Vail Ski Area Category III Development Environmental Impact Statement

No Action
Alternative

October 1995



Note:
Due to scale of map, ski facility locations are
representative and not in their exact locations.

MAP
1

KEY:
—Two Elk Creek
& other drainages



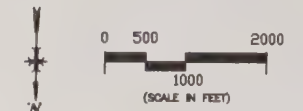
Final Mapping and Geographical Analysis:
Pioneer Environmental Services Inc.
Logan, Utah 1995

Source of Digital Base Map: Vail Associates, Inc. 1993

Vail Ski Area Category III Development Environmental Impact Statement

Master Development Plan

October 1995

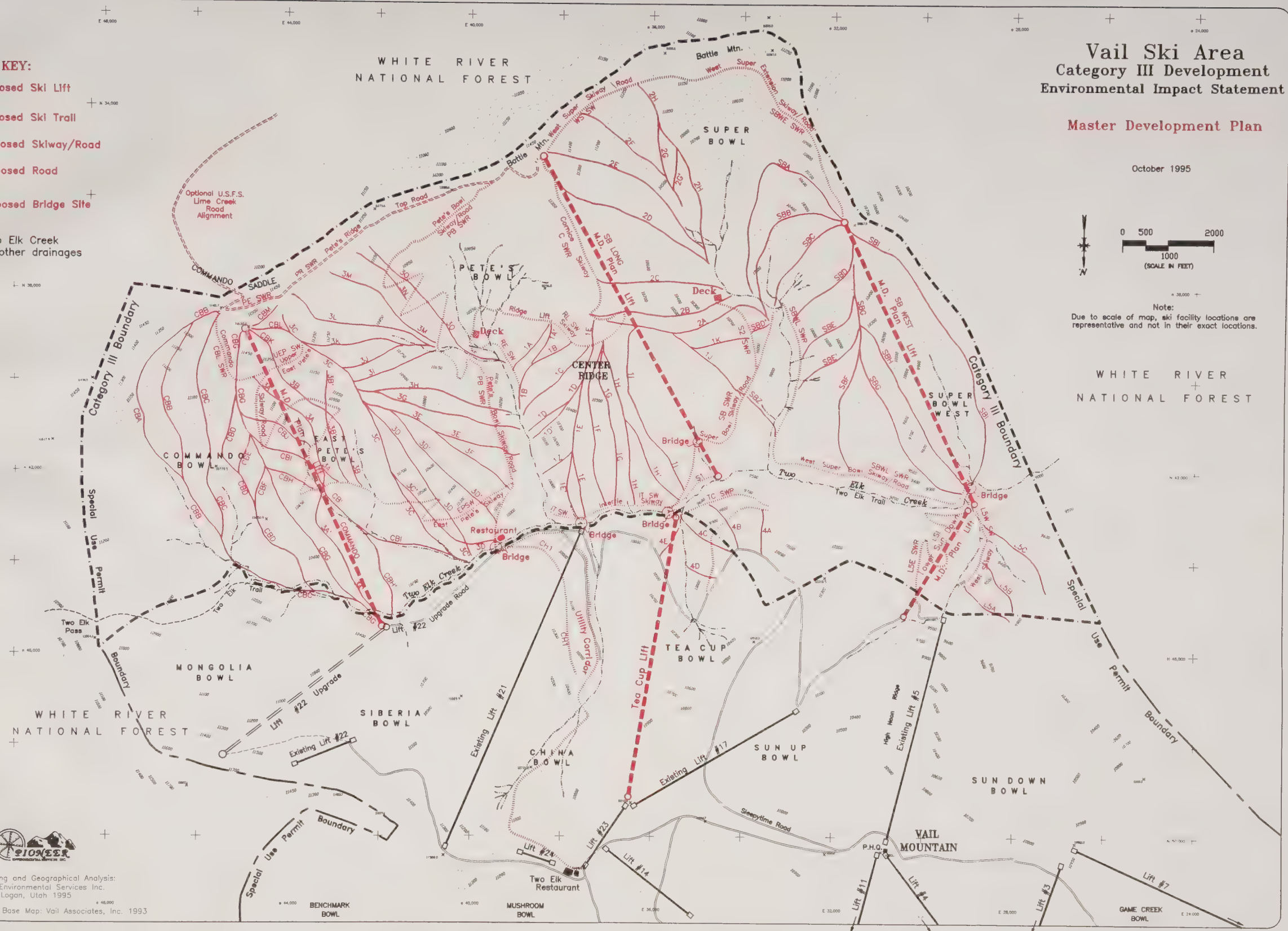


Note:
Due to scale of map, ski facility locations are representative and not in their exact locations.

WHITE RIVER
NATIONAL FOREST

MAP
4

- KEY:**
- Proposed Ski Lift
 - Proposed Ski Trail
 - Proposed Skiway/Road
 - Proposed Road
 - Proposed Bridge Site
 - Two Elk Creek & other drainages



Final Mapping and Geographical Analysis:
Pioneer Environmental Services Inc.
Logan, Utah 1995

Source of Digital Base Map: Vail Associates, Inc. 1993

Vegetation Cover Types:

AS - Aspen Forest
AC - Aspen/Conifer
GM - Grassland/Meadow
SF - Spruce/Fir Forest
LP - Lodgepole Forest
MF - Mixed Forest
MS - Mixed Savannah
SS - Spruce/Fir Savannah
LS - Lodgepole Savannah
MB - Mountain Brush
WR - Willow/Riparian
SC - Rock/Scree
SAS - Special Aquatic Site

● SFO - Spruce/Fir (Old Growth)

Note: the acreages presented in Table 3.7. reflect only the portion of each veg. cover type found within the project area boundary

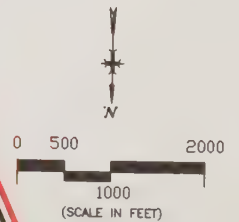
Vail Ski Area Category III Development Environmental Impact Statement

October 1995


34,000



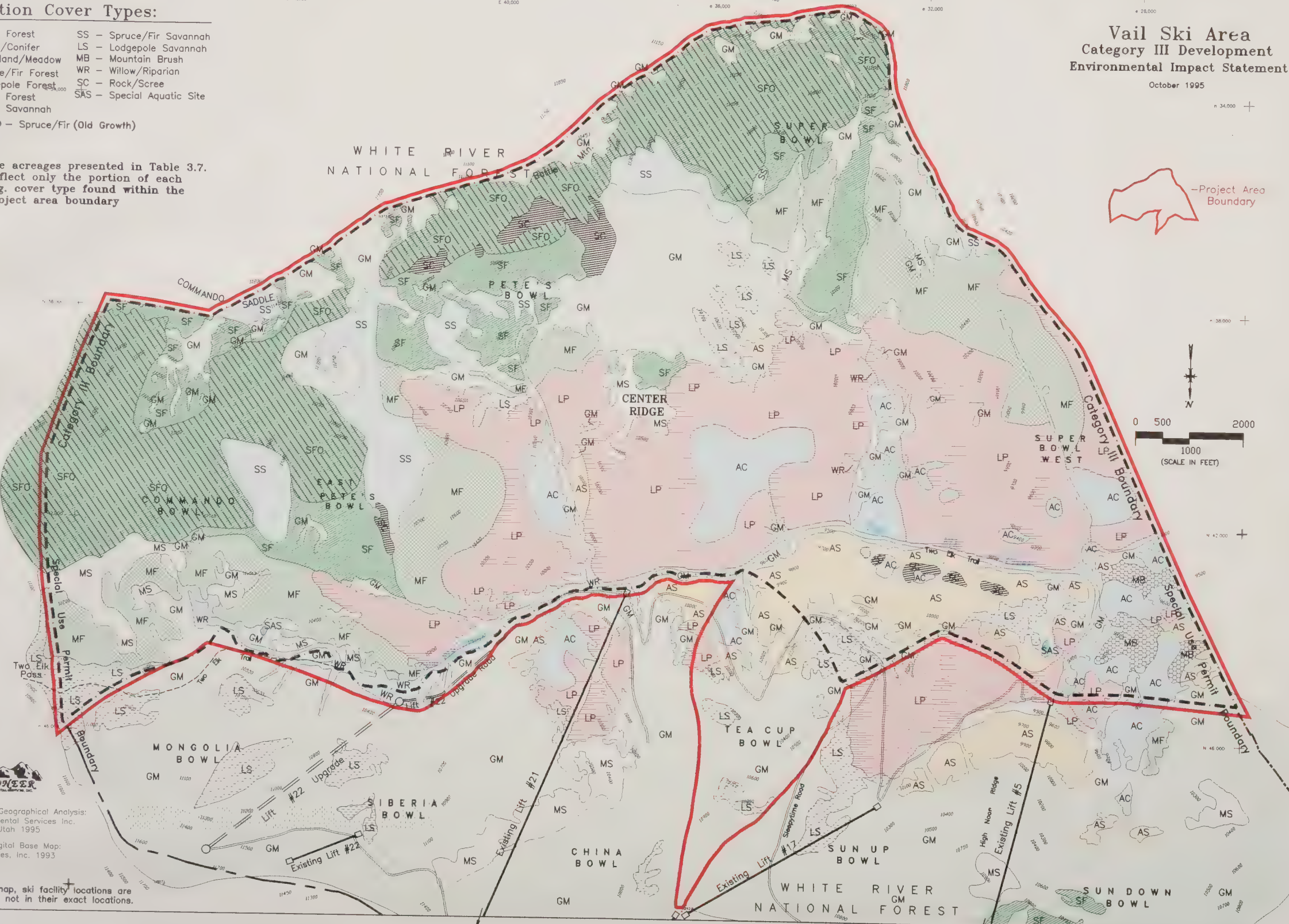
-Project Area Boundary



MAP
5


Final Mapping and Geographical Analysis:
Pioneer Environmental Services Inc.
Logan, Utah 1995
Source of Digital Base Map:
Vail Associates, Inc. 1993

Note:
Due to scale of map, ski facility locations are
representative and not in their exact locations.



Vail Ski Area Category III Development Environmental Impact Statement

October 1995

Eagles Nest
Wilderness

Eagles Nest
Wilderness

MAP
6



Landscape Area Vegetation Cover Types:

GM - grass
WM - meadow
SC - rock
MB - shrub
U - urban
AS - aspen
LP - lodgepole
SF - spruce/fir
DF - Douglas fir
OW - open water

Sub-types

W = Wet
r = Recruitment
og = Old Growth

U.S.F.S. Refined
RIS Data

Holy Cross
Wilderness

Holy Cross
Wilderness

WHITE RIVER
NATIONAL
FOREST

Source of base map:
U.S.G.S. 7.5 min. Quad Overlays
Vail East, Vail West, Vail Pass,
Minturn, Red Cliff

U.T.M. grid, zone 13



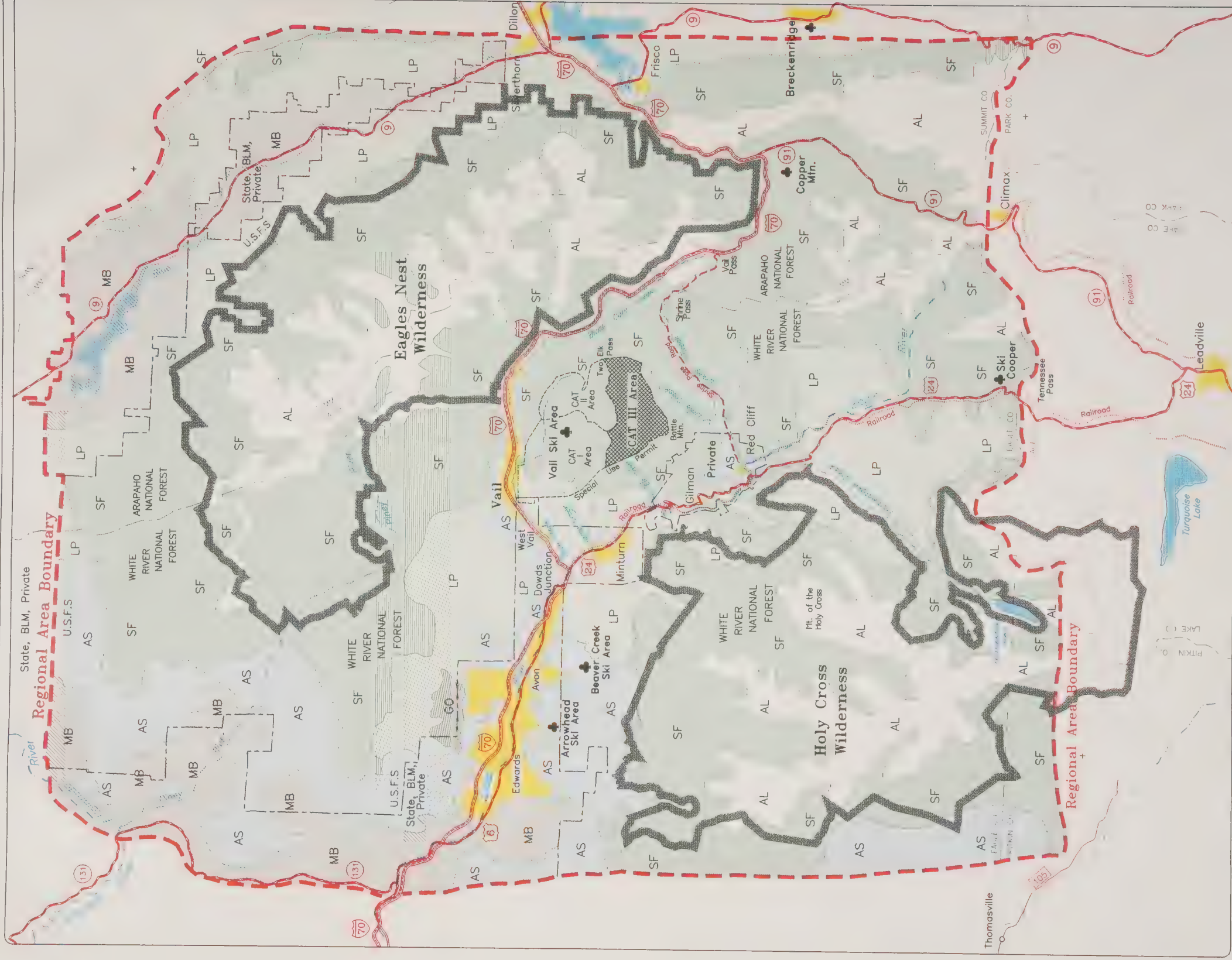
Regional Area Vegetation Cover Types:

- LP - Lodgepole
- AL - Alpine
- GO - Gambel Oak
- AS - Aspen
- SF - Spruce/Fir
- MB - Mountain Brush
- Urban/Residential



Vail Ski Area Category III Development Environmental Impact Statement

October 1995



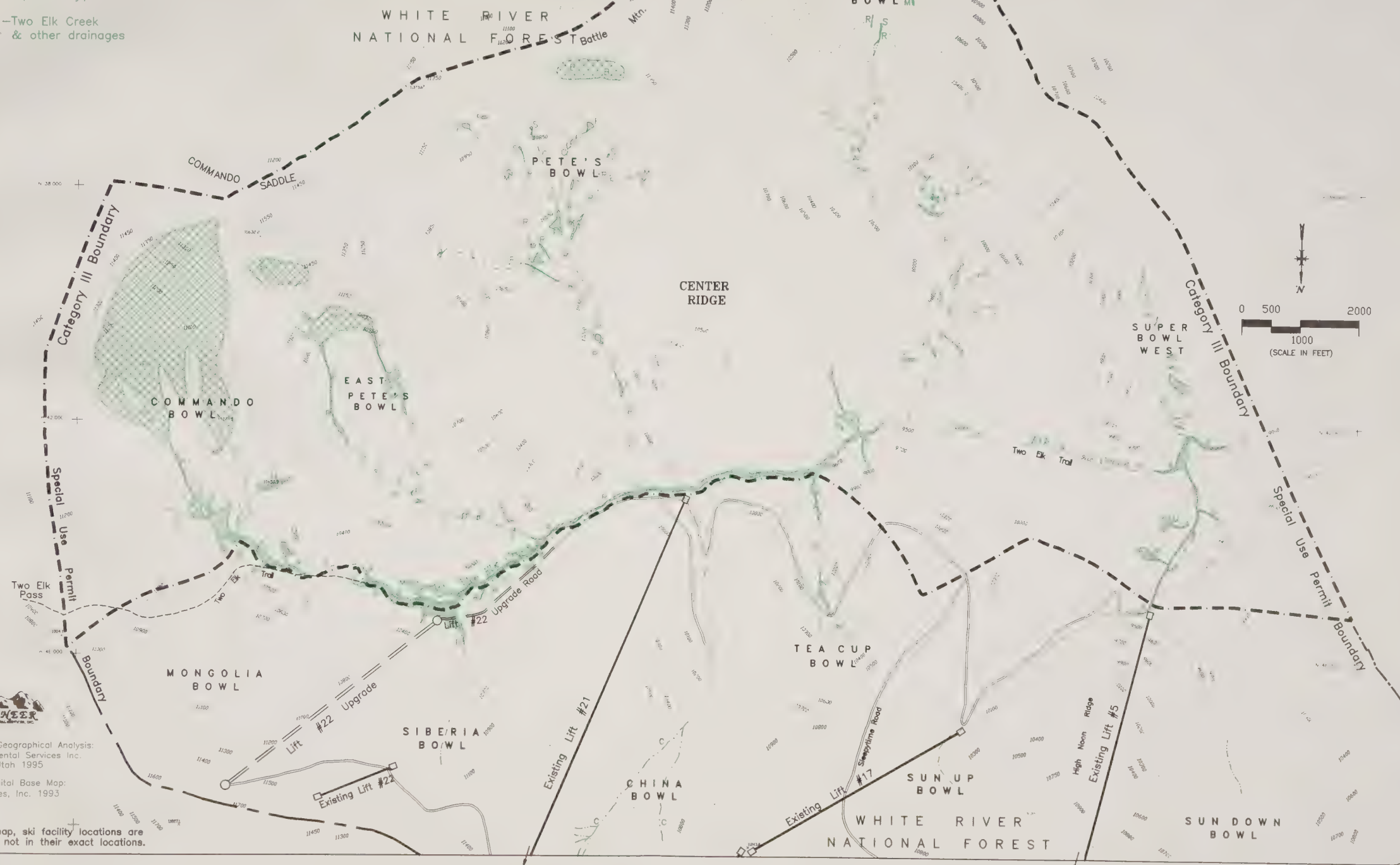
Jurisdictional Wetlands

- Wetlands & Waters of the U.S.
- Narrow Riparian
- Complex of Wetland & Upland Types
- Two Elk Creek & other drainages

- R-Riparian Wetlands
- F-Forested/Seep Wetland Complex
- M-Subirrigated Wetland Meadow
- C-Waters of the U.S. Channel
- S-Seep/Spring Complex
- B-Snowbed Wetland Complex

Vail Ski Area Category III Development Environmental Impact Statement October 1995

34,000



Final Mapping and Geographical Analysis:
Pioneer Environmental Services Inc.
Logan, Utah 1995

Source of Digital Base Map:
Vail Associates, Inc. 1993

Note:
Due to scale of map, ski facility locations are
representative and not in their exact locations.

Vail Ski Area Category III Development Environmental Impact Statement

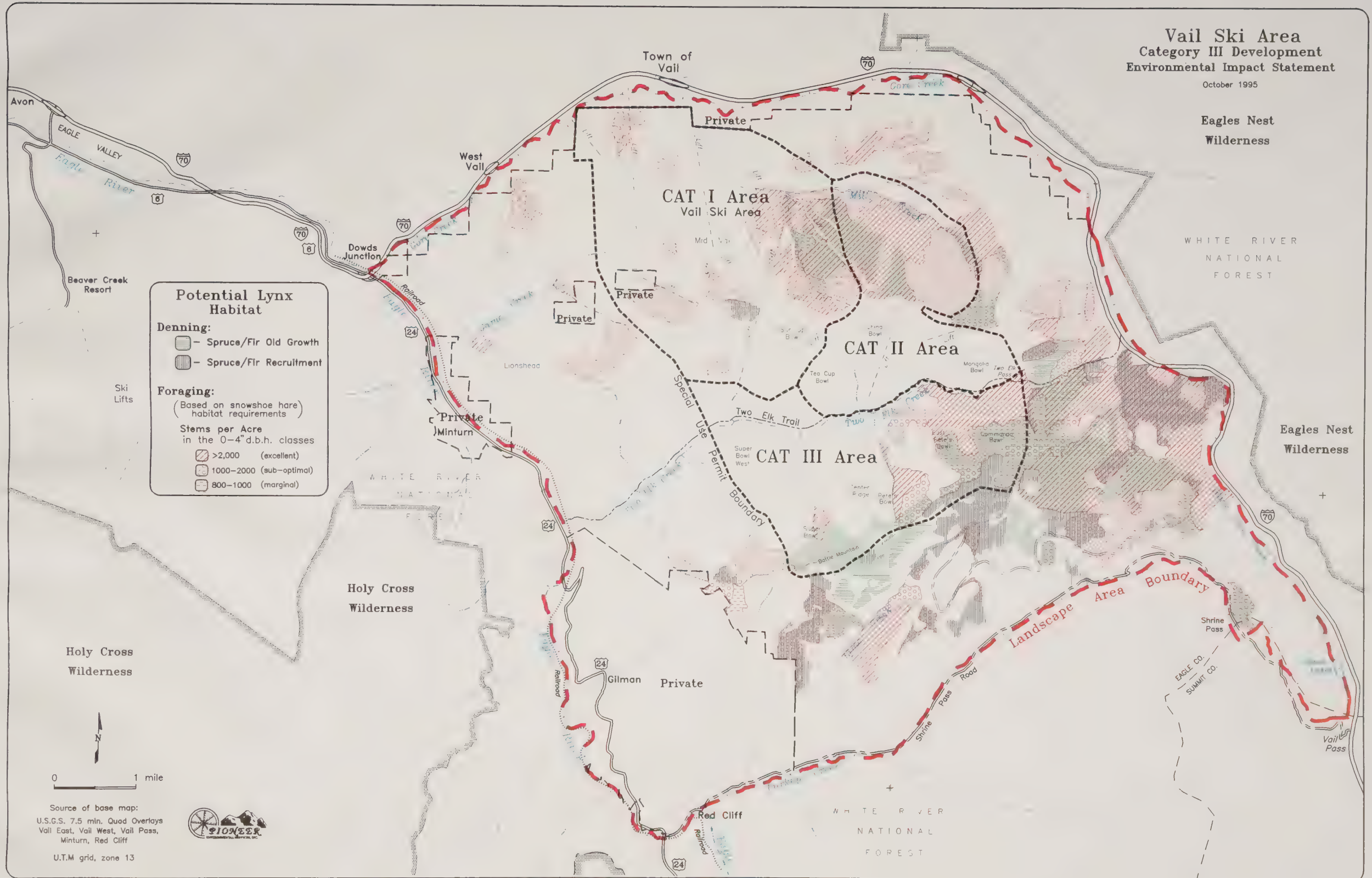
October 1995

Eagles Nest
Wilderness

WHITE RIVER
NATIONAL
FOREST

Eagles Nest
Wilderness

M
A
P
9



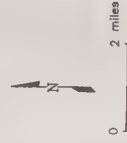
Source of base map:
U.S.G.S. 7.5 min. Quad Overlays
Vail East, Vail West, Vail Pass,
Minturn, Red Cliff

U.T.M grid, zone 13



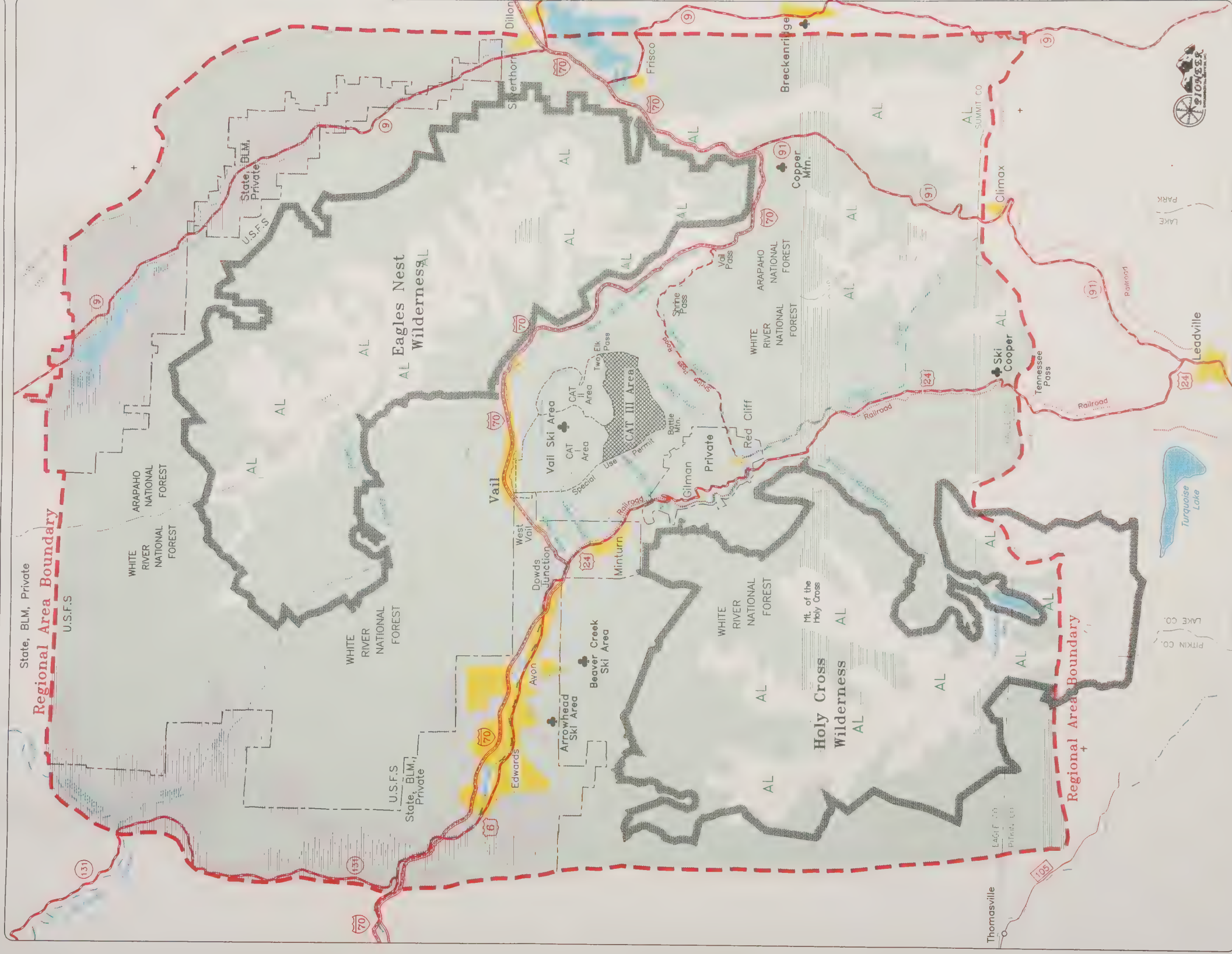
Regional Area
Vegetation Cover Types:

- AL - Alpine
- - Forest Cover
- - Shrublands
- - Urban/Residential



Vail Ski Area
Category III Development
Environmental Impact Statement

October 1995



KEY:

- Proposed Ski Lift
- Proposed Ski Trail
- Proposed Skiway/Road
- Proposed Bridge Site

Note: Varied color scheme represents the different "Pod" groupings.

- = Center Pod
- = Super Pod
- = Tea Cup Pod

Vegetation Cover Types:

- | | |
|------------------------|----------------------------|
| AS - Aspen Forest | SS - Spruce/Fir Savannah |
| AC - Aspen/Conifer | LS - Lodgepole Savannah |
| GM - Grassland/Meadow | MB - Mountain Brush |
| SF - Spruce/Fir Forest | WR - Willow/Riparian |
| LP - Lodgepole Forest | SC - Rock/Scree |
| MF - Mixed Forest | SAS - Special Aquatic Site |
| MS - Mixed Savannah | |
- SFO - Spruce/Fir (Old Growth)

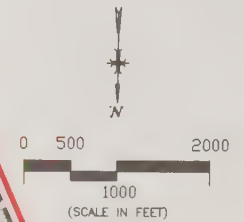
**Vail Ski Area
Category III Development
Environmental Impact Statement**

October 1995

**Center Ridge
Alternative
(By Pod)**

-Project Area Boundary

Note: the acreages presented in Table 3.7. reflect only the portion of each veg. cover type found within the project area boundary

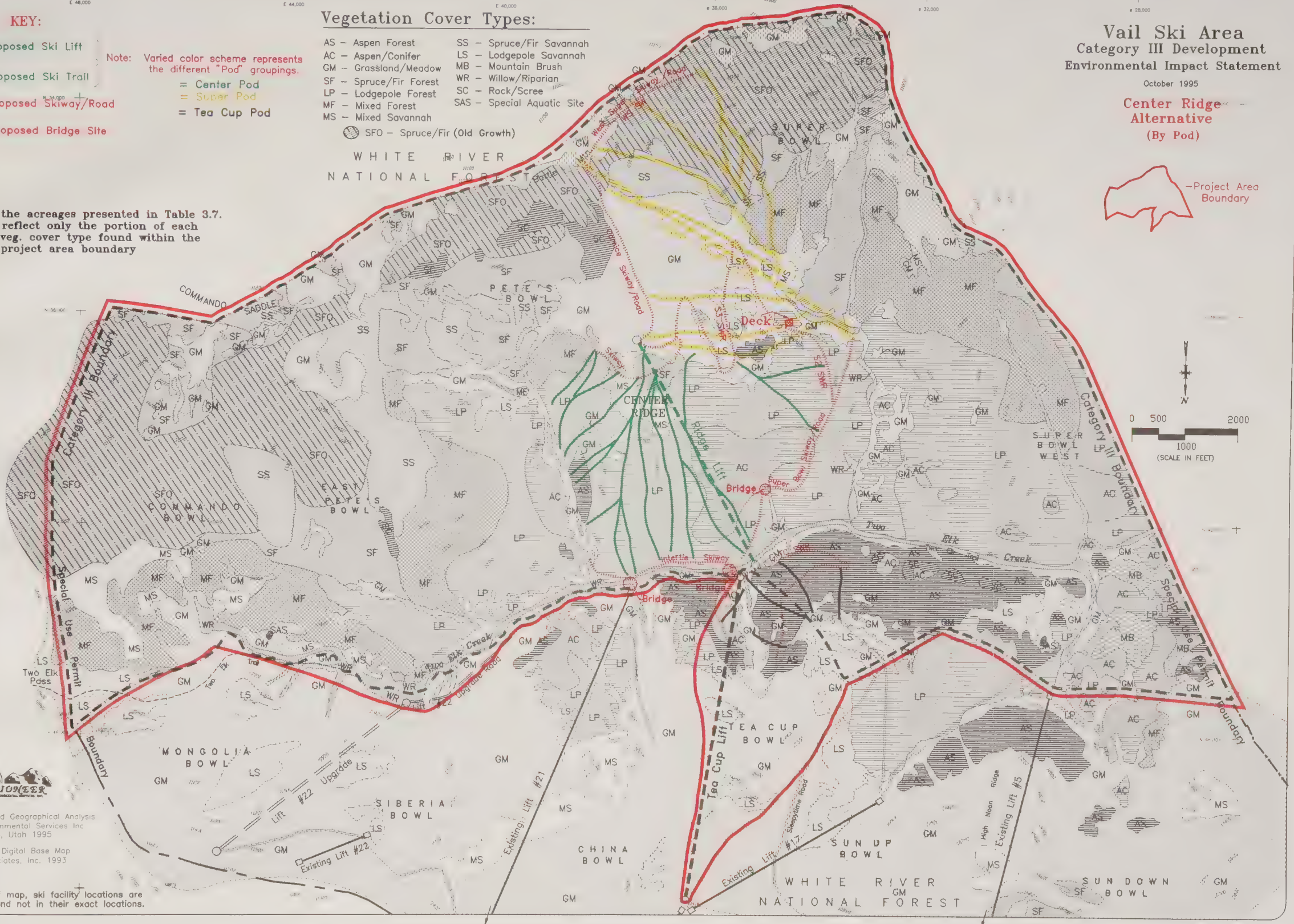


MAP
11

PIONEER
Environmental Services, Inc.
Final Mapping and Geographical Analysis
Pioneer Environmental Services Inc
Logan, Utah 1995

Source of Digital Base Map
VCI Associates, Inc. 1993

Note:
Due to scale of map, ski facility locations are representative and not in their exact locations.



KEY:

- Proposed Ski Lift
- Proposed Ski Trail
- Proposed Skiway/Road
- Proposed Road
- Proposed Bridge Site

Note: Varied color scheme represents the different "Pod" groupings.

= Center Pod

= Tea Cup Pod

= Pete's Pod

Vegetation Cover Types:

- | | |
|------------------------|----------------------------|
| AS - Aspen Forest | SS - Spruce/Fir Savannah |
| AC - Aspen/Conifer | LS - Lodgepole Savannah |
| GM - Grassland/Meadow | MB - Mountain Brush |
| SF - Spruce/Fir Forest | WR - Willow/Riparian |
| LP - Lodgepole Forest | SC - Rock/Scree |
| MF - Mixed Forest | SAS - Special Aquatic Site |
| MS - Mixed Savannah | |
- SFO - Spruce/Fir (Old Growth)

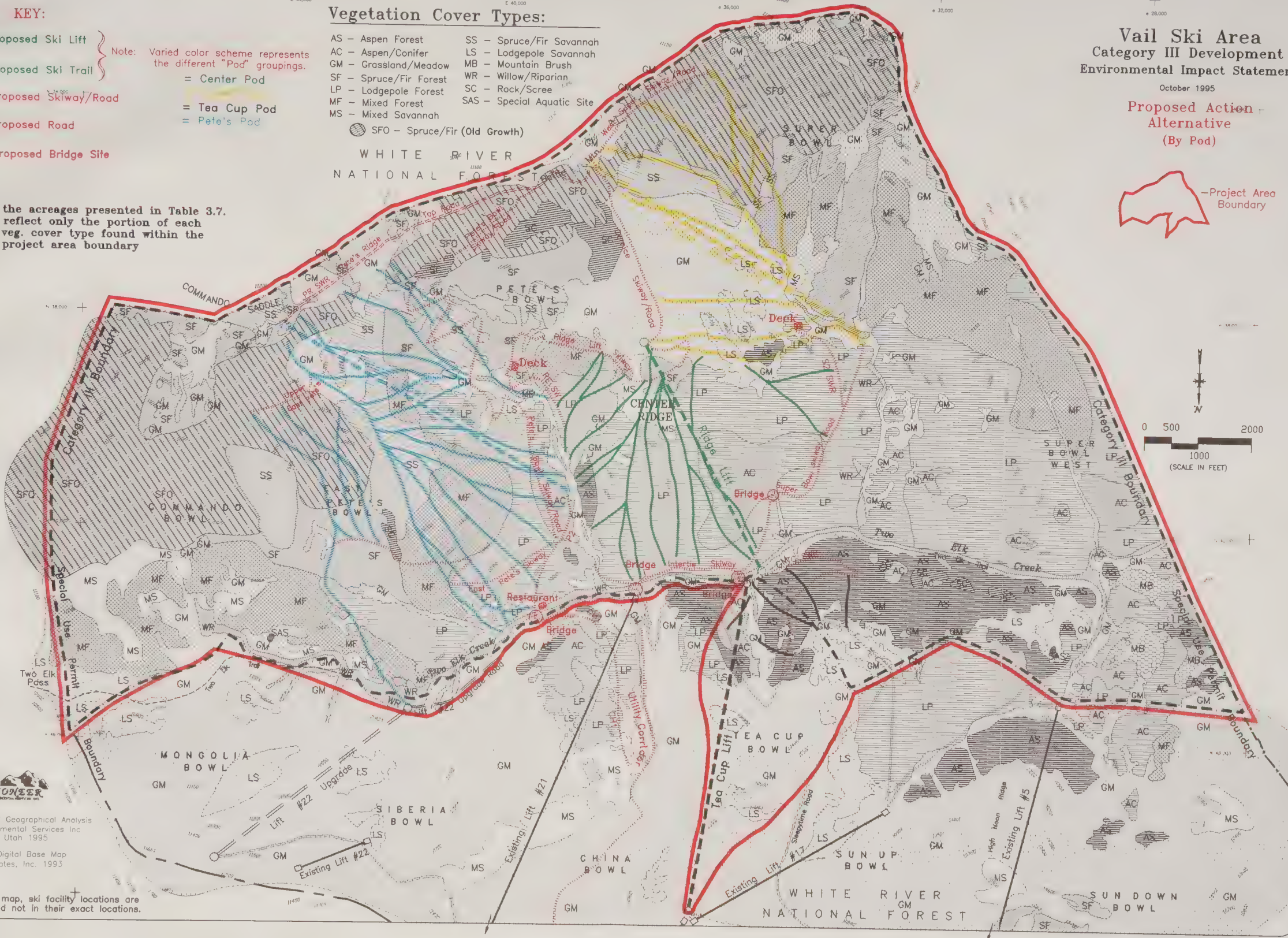
Vail Ski Area
Category III Development
Environmental Impact Statement

October 1995

**Proposed Action -
Alternative**
(By Pod)



Note: the acreages presented in Table 3.7. reflect only the portion of each veg. cover type found within the project area boundary



Final Mapping and Geographical Analysis
Pioneer Environmental Services Inc.
Logan, Utah 1995

Source of Digital Base Map
Vail Associates, Inc. 1993

Note:
Due to scale of map, ski facility locations are representative and not in their exact locations.

KEY:

Note: Varied color scheme represents the different "Pod" groupings.

- = Commando Pod
- = Super Bowl Long
- = Tea Cup Pod
- = Super West Pod
- = Sun Down Pod

-Proposed Skiway/Road

-Proposed Road

-Proposed Bridge Site

Vegetation Cover Types:

- | | |
|------------------------|----------------------------|
| AS - Aspen Forest | SS - Spruce/Fir Savannah |
| AC - Aspen/Conifer | LS - Lodgepole Savannah |
| GM - Grassland/Meadow | MB - Mountain Brush |
| SF - Spruce/Fir Forest | WR - Willow/Riparian |
| LP - Lodgepole Forest | SC - Rock/Scree |
| MF - Mixed Forest | SAS - Special Aquatic Site |
| MS - Mixed Savannah | |
- SFO - Spruce/Fir (Old Growth)

**Vail Ski Area
Category III Development
Environmental Impact Statement**

October 1995

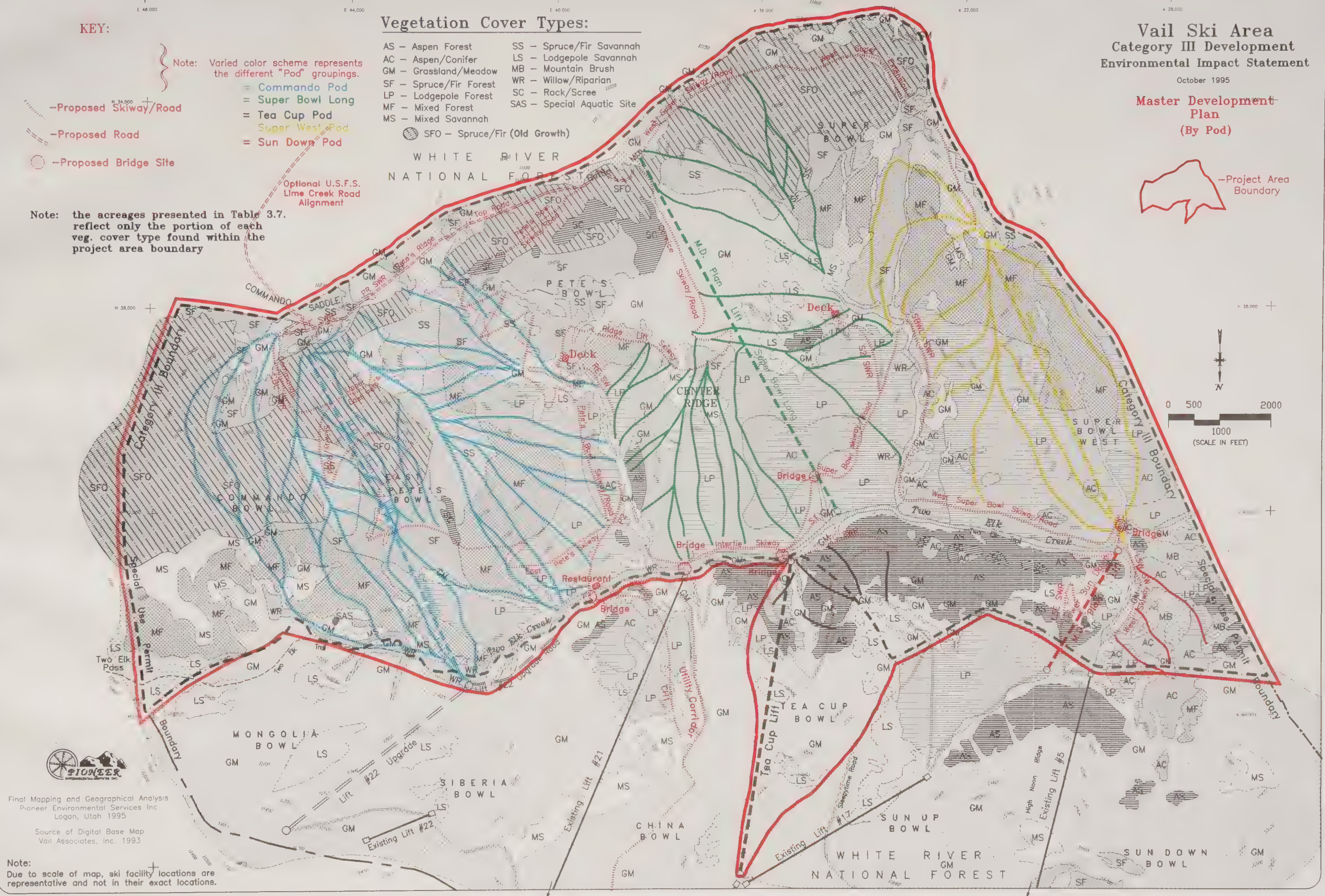
**Master Development
Plan
(By Pod)**

-Project Area Boundary

Note: the acreages presented in Table 3.7. reflect only the portion of each veg. cover type found within the project area boundary



**MAP
13**



Final Mapping and Geographical Analysis
Pioneer Environmental Services Inc.
Logan, Utah 1995

Source of Digital Base Map
Vail Associates, Inc. 1993

Note:
Due to scale of map, ski facility locations are
representative and not in their exact locations.

Jurisdictional Wetlands

- Wetlands & Waters of the U.S.
- Narrow Riparian
- Complex of Wetland & Upland Types
- Two Elk Creek & other drainages
- R - Riparian Wetlands
- F - Forested/Seep Wetland Complex
- M - Subirrigated Wetland Meadow
- C - Waters of the U.S. Channel
- S - Seep/Spring Complex
- B - Snowbed Wetland Complex

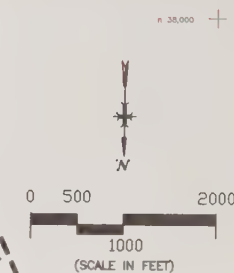
Vail Ski Area Category III Development Environmental Impact Statement

October 1995

Center Ridge Alternative

KEY:

- Proposed Ski Lift
- Proposed Ski Trail
- Proposed Skiway/Road
- Proposed Bridge Site

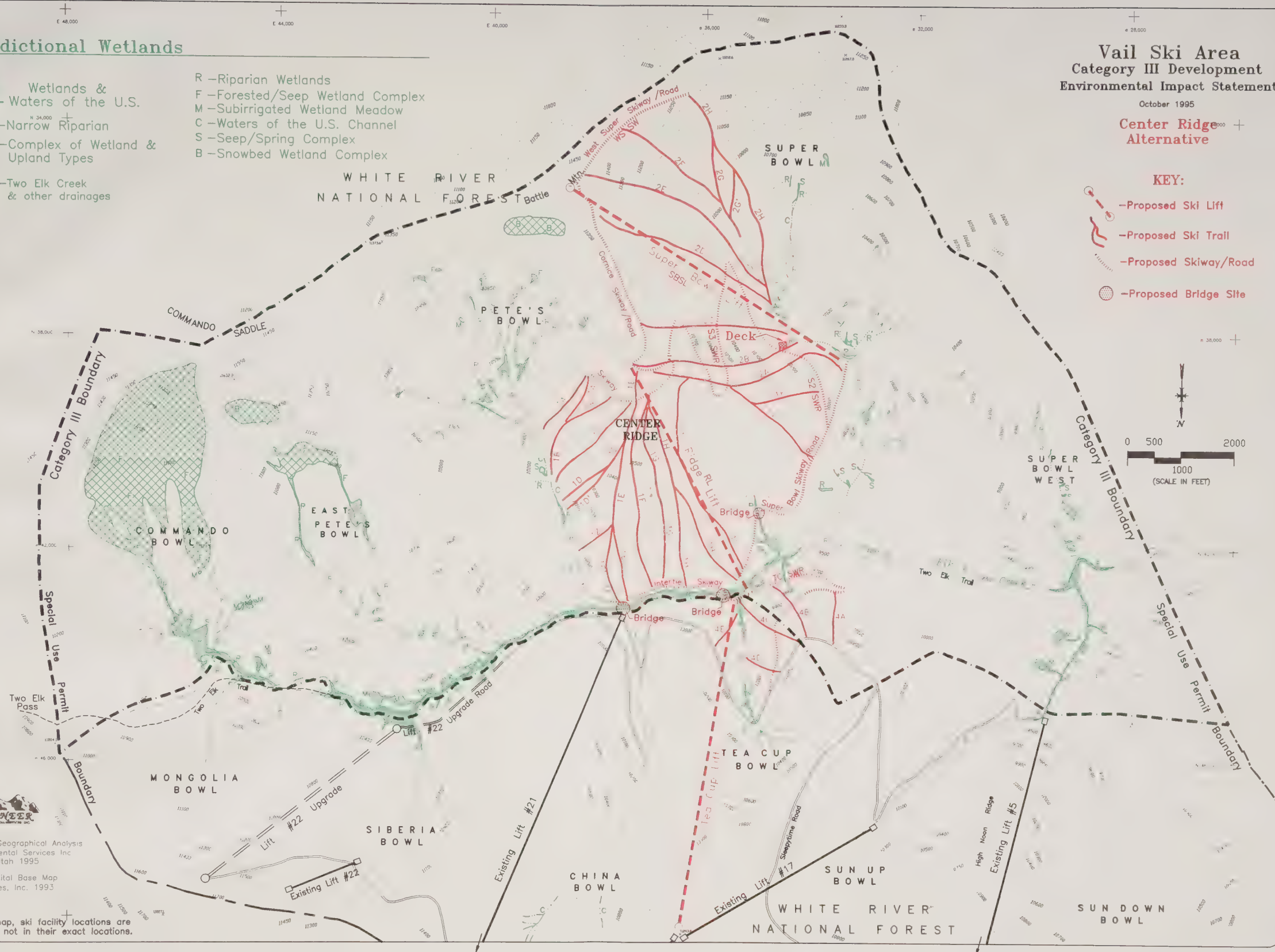


MAP
14






Final Mapping and Geographical Analysis
Pioneer Environmental Services Inc.
Logan, Utah 1995

Source of Digital Base Map
Vail Associates, Inc. 1993

Note:
Due to scale of map, ski facility locations are
representative and not in their exact locations.



Jurisdictional Wetlands

-  Wetlands & Waters of the U.S.
-  -Waters of the U.S.
-  -Narrow Riparian
-  -Complex of Wetland & Upland Types
-  -Two Elk Creek & other drainages






- R - Riparian Wetlands
- F - Forested/Seep Wetland Complex
- M - Subirrigated Wetland Meadow
- C - Waters of the U.S. Channel
- S - Seep/Spring Complex
- B - Snowbed Wetland Complex

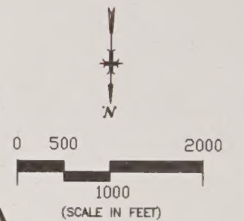
Vail Ski Area Category III Development Environmental Impact Statement

October 1995

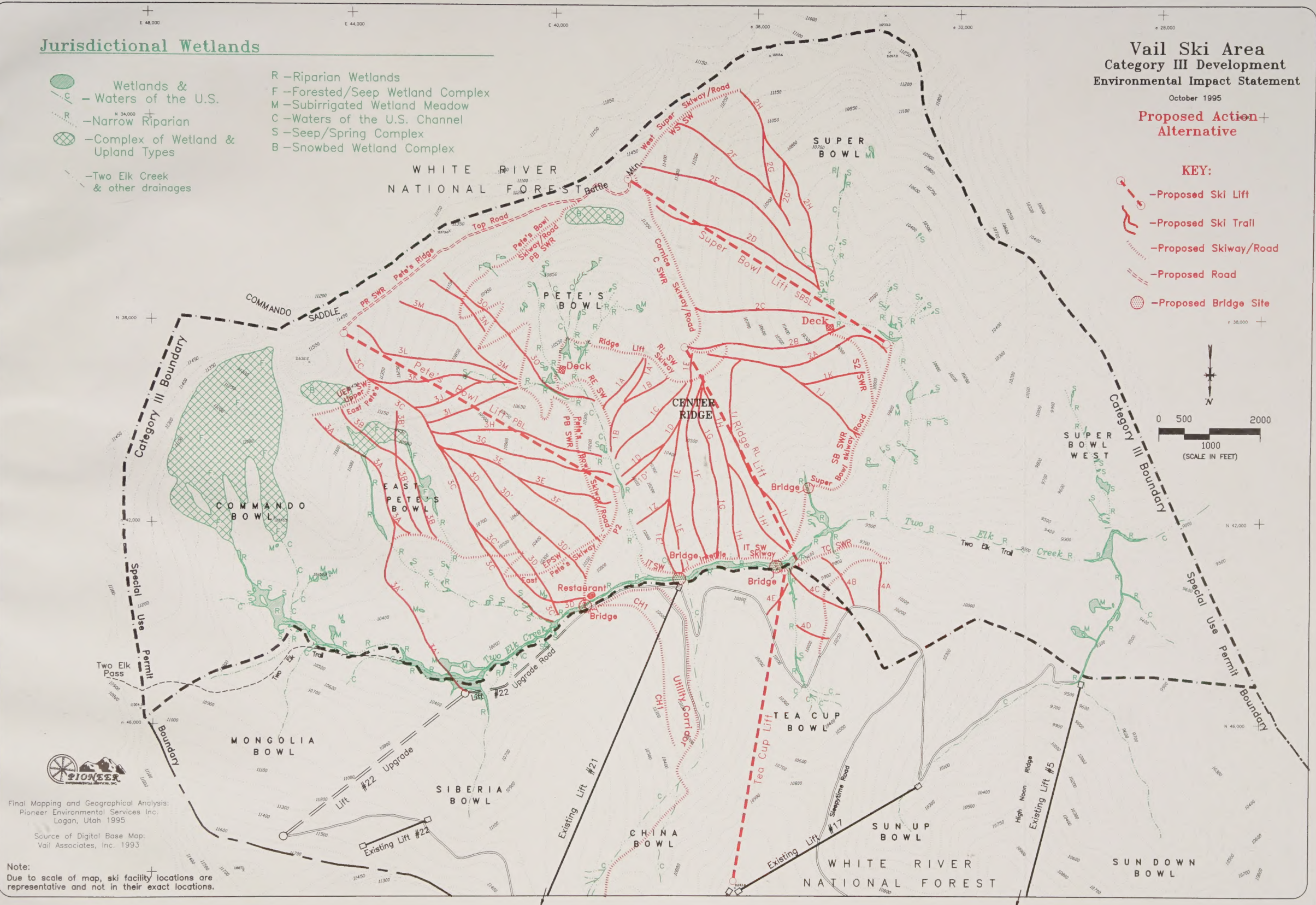
Proposed Action + Alternative

KEY:

-  -Proposed Ski Lift
-  -Proposed Ski Trail
-  -Proposed Skiway/Road
-  -Proposed Road
-  -Proposed Bridge Site



MAP
15



Final Mapping and Geographical Analysis:
Pioneer Environmental Services Inc.
Logan, Utah 1995

Source of Digital Base Map:
Vail Associates, Inc. 1993

Note:
Due to scale of map, ski facility locations are
representative and not in their exact locations.

Jurisdictional Wetlands

- Wetlands & Waters of the U.S.
- Narrow Riparian
- Complex of Wetland & Upland Types
- Two Elk Creek & other drainages

- R - Riparian Wetlands
- F - Forested/Seep Wetland Complex
- M - Subirrigated Wetland Meadow
- C - Waters of the U.S. Channel
- S - Seep/Spring Complex
- B - Snowbed Wetland Complex

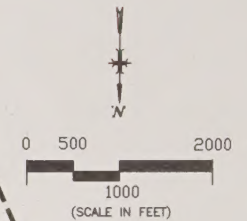
Vail Ski Area Category III Development Environmental Impact Statement

October 1995

Master Development Plan

KEY:

- Proposed Ski Lift
- Proposed Ski Trail
- Proposed Skiway/Road
- Proposed Road
- Proposed Bridge Site



MAP
16

Final Mapping and Geographical Analysis:
Pioneer Environmental Services Inc.
Logan, Utah 1995

Source of Digital Base Map:
Vail Associates, Inc. 1993

Note:
Due to scale of map, ski facility locations are
representative and not in their exact locations.

